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Smoke (Preventing, Burning, and Condensing. —H. J. and J. W. Wilson, 5239.

Spindles, &c.—J. Brooksby, 19.

Spinning and Preparing for Spinning.—H. S. and J. and J. Holt, 5242. W. Wood, 5273. J. S. Dronsfield, 5283. W. F. Mason and J. Holding, 5328. J. Brooksby, 19. J. Dodd, 72. J. Dodd, 72. J. T. Dronsfield, 75. J. Schofield, J. Walton, and T. Holt, 235.

Springs.—M. Gally, 14. L. Stean, 66.

Steam (Supplying, &c.)—H. J. Haddan (com.), 120.

Steam and other Boilers, Cleaning and Preventing Incrustation of Boilers, Water Feeding Apparatus for Boilers.—J. Blake, 5254. J. Scott, 5280. W. Fergusson, 5282. H. J. Haddan (com.), 31. J. Warwick, 200.

Steam Engines (Stationary, Locomotive, and Marine.)—W. R. Lake (com.), 5275. J. Turnbull, 5287. A. Q. Ross, 5311. T. C. Watts, 5339. P. W. Willans, 5331. W. E. Koehs, 23. H. W. Bulkley, 76. W. Hartley, 89. J. C. Mewburn (com.), 105. R. E. Middleton, 182. H. Vinoles and S. Ayton, 186. A. Thompson, 196. R. Leybourne, 199. C. M. Jacobs, 238.

Susphur.—P. Spence, 5260.

Telegraphs; Telegraph Printing Apparatus.—F. R. Lucus, 5270. S. Pitt (com.), 5292. R. R. Boyle, 5313. J. S. Pierson, 5321. J. Imray (com.), 60. W. R. Lake (com.). 229.

Tents, &c.—W. Hatchman, 77.

Thermometers, Barometers, Pyrometers.—W. Morgan-Brown (com.), 5255.

Tilling and Cultivating, &c.—R. Cichowski, 13. J. R. Jeffries, 22. W. R. Watson (com.), 124.

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Umbrellas, Parasols, &c.—J. Cross, 5236.

Upholttery, &c. H. Simon (com.), 5401. R. Barlow, 24. A. Alexander and T. W. Dunn, 99. H J. Haddan (com.), 188.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—W. R. Lake (com.), 5275. R. L. Warner and J. J. Bown, 5276. J. Turnbull, 5287. C. de Nottbeck, 5295. R. S. Riptey (com.), 5314. H. Richmann and W. K. Arnold, 104. W. Warner, 171. E. L. Voice, 174. W. R. Lake (com.), 193. R. Layboarne, 199. J. S. Barnett and J. Hodgkins, 220. C. M. Jacobs, 238.

Velocipedes, Bicycles.—H. J. Lawson, 5298. S. L. Broom, 1. A. L. Bricknell, 53. W. S. Lavis, 137. J. Harrington and H. Brent, 190. E. G. Bruton, 208.

Ventilation; Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—H. Lacy, 86. W. H. Robins, 87. J. G. Tongue (com.), 92. J. S., T. A. and E. R. Walker, 122.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—J. Wendle and P. D. Davey, 5304. C. Wood, 145.

Waterclosets, &c.—J. Sweaton and S. Palmer, 5342. H. Whiley, 10.

Waterwheels and Engines, &c.—A. M. Clark (com.), 15. T. C. Glaser (com.), 237.

Waterproofing, &c.—O. Streubel, 125.

Weaving, Braiding, Plaiting, Preparing for Weaving.—C. Hahlo and C. E. Liebriech (com.), 5244. R. C. Stephenson (com.), 5269. H. Portway, 5520.

Weighing Machines, Scales, Indicating Weight. —J. Craig, 5235.

Wheels for Carriages, &c.—H. J. Lawson, 5296. B. Tillett (com.), 34.

Wheels for Machinery.—J. G. Wilson (com.), 5310. M. Gally, 14. S. Buckley and J. Taylor, 90

Window Blinds, &c.—H. Simon (com.), 5301. W. S. Simpson, 160.

Wire-Working, Wire Ropes, Telegraph Cables.—F. C. Glaser (com.), 5279. R. S. Newall, 69. J. Lang, 138.

*** *The above List is prepared from the Paten Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Mr. Washington H. Tucker, of Stone Fort, Ill., has devised an improved trough for feeding hogs with any desired kind of feed, and which is so constructed as to prevent the hogs from wasting their food, from getting into their trough with their feet, or interfering with each other while eating.

Mr. David Englar, jun., of Avondale, Md., has devised an improved guano distributor, which consists in a cam-grooved cylinder, located and revolving in the hopper of the machine, and a clearer and discharge regulator, which project up through the bottom of the hopper, and are reciprocated horizontally as they follow the cam groove. The guano is removed from the cam groove by means of the clearer, and falls into the tube or spout, which conducts it into the furrow in rear of the hoe or shovel.

THOMAS SOPWITH.

At Westminster on Thursday, the 16th inst., Mr. Thomas Sopwith died. He was born, says the *Athenæum*, from which we quote the following notice, at Newcastle-on-Tyne in 1803, consequently he was in the seventy-sixth year of his age. For more than half a century Mr. Sopwith has been a diligent student of science, especially in geology and mining. We find that that as early as 1829 he published geological sections of several of the lead mines in Alston Moor and Teesdale. In 1833 he write "An Account of the Mining Districts of Alston Moor, Weardale, and Teesdale," which attracted considerable attention from the clear and interesting style in which it was written. In this year Mr. Sopwith became a member of the Institution of Civil Engineers, having previously devoted considerable attention to mining engineering, which, in some respects, he greatly improved. In 1832 he published a memoir "On the Application of Isometrical Projection to Geological Plans and Sections," and in 1838 a "Treatise on Isometrical Drawing as applicable to Geological and Mining Plans." In this year Mr. Sopwith was appointed a Commissioner for the Crown, under the Dean Forest Mining Act, being associated with Mr. John Probyn and the celebrated mining engineer John Buddle. "The Awards" of the Dean Forest Mining Commissioners were drawn up by Mr. Sopwith, and published in 1841. Mr. Sopwith at this time constructed a very complete map of Dean Forest, and made a large model of it, capable of dissection, which showed, in true scale, the surface of the forest and all the subterranean workings of coal and ironstone.

In 1835 Mr. Sopwith was elected a Fellow of the Geological Society, and he greatly advanced, by facilitating, the study of geology, through the construction of a series of models, which showed in a very striking manner the nature of stratification, the valleys of denudation, the succession of coal seams, and other geological phenomena. A treatise explaining these models was published in 1841. In 1838 Mr. Sopwith brought before the British Association a paper "On the National Importance of Preserving Mining Records." This matter had been first urged by Mr. William Thomas in 1797, and again by Mr. William Chapman in 1815. Upon the suggestions made by these colliery viewers, by John Buddle and other practical mining engineers, Mr. Sopwith founded his communication, in which he amplified the strong evidence brought forward, and urged, with yet more force, the necessity of adopting legislative measures to secure the desired end. The result of this was the formation of a committee of some of the leading members of the Association, who met in Newcastle-on-Tyne on the 25th of August, 1838, and agreed to memorialise the Government, followed up by the zealous advocacy of the Marquis of Northampton and Sir Henry De la Beche, led to the establishment of the Mining Record Office, in connection with the Museum of Practical Geology. Mr. Sopwith may, therefore, be regarded as really the prime mover in establishing this important office. In 1845 Mr. Sopwith was elected a Fellow of the Royal Society. About the same time he received the honour of an M.A. degree, and of being chosen honorary member of several foreign and important local societies. To the Geological Society of the West Riding of Yorkshire he contributed a memoir "On the Evidence of the Former Existence of Glaciers in England," and one "On the Mining Districts of the North of England" to the *Proceedings* of the Royal Institution.

For a long period Mr. Sopwith was the manager of the most important lead mines in this country, into which he introduced important improvements.

Reviews.

THE LONDON SCIENCE TEXT-BOOKS.

"Botany." By Professor W. B. M'Nab, M.D.
"Hydrostatics and Pneumatics." By Philip Magnus, B.Sc. B.A.
"Practical Physics: Molecular Physics." By Professor F. Guthrie, Ph.D., F.R.S.
"Zoology." By Professor A. M'Alister, M.D.
"Geometry: Congruent Figures." By Professor Henrici, F.R.S. London: Longmans, Green, and Co. 1878.

These little volumes form part of a series of class books, edited by Professors G. C. Foster, F.R.S., and P. Magnus, B.Sc., and are adapted more particularly for school teaching (we presume the higher classes in schools), and have been written, so says their editor, to supply a want of books adapted for school purposes. That there are a number of series of science books, both elementary and advanced, cannot be questioned, but with reference to this series, we are inclined to think that for school purposes they will be found very useful. We note an introductory volume is on the list. It seems rather anomalous to have a number of the series issued without the introductory one. It reminds us of a series of volumes similar to these which were issued some three years since, with the intimation that such a volume, and by a well-known professor, was in the press; and so far as we can ascertain, this volume has not yet seen the light. We trust it will not be the same with this series.

THE MAGIC LANTERN.

"The Magic Lantern Manual." By W. J. Chadwick. London: Frederick Warne & Co.

Winter-time brings round those entertainments in which the magic lantern is freely used for the amusement of both old and young. This volume describes the various forms of magic lantern slides, with the details and applications, and, further, it serves the purpose of instructing the learner. We note on the volume most of the forms of lanterns are illustrated and described; but although the trinopticon and sciopticon are thus dealt with, we fail to find a word descriptive of Hughes's triplexicon, which we think is well worthy of a place in the volume.

THE ANALYST.

"The Analyst," including the Proceedings of the Society of Public Analysts.

The January number of this interesting and instructive periodical contains some important articles, "On the Detection and Estimation of Alum in Wheat Flour," by Dr. Dupré, F.R.S.; "On the Detection of Alum in Flour by the Logwoood Test," by C. W. Young, F.C.S.; "On the Logwood Test for Alum," by W. W. Stoddart, F.I.C.; "On the Nitrogenous Constituents of Cocoa," by G. W. Wigner, F.C.S.; "On a Ferment produced by Growth of Bioplasm of Yolk of Egg," by W. Thompson, F.R.S.E.; "Amount of Solids in Milk," by C. A. Cameron, M.D.

We have had our attention drawn to a sample of Messrs. Lechertier, Barbe, and Co.'s, of 60, Regent-street, W., improved shilling Moist-Colour Boxes, and for the price it certainly commends itself to students and beginners.

An improvement in hay elevators has been patented by Mr. Joseph W. Higgs, of Sharon, Pa. The object of this invention is to furnish a device for moving hay from the waggon to the mow in the barns. It is simple in construction, convenient and reliable.

TECHNICAL EDUCATION AND MECHANICAL TRAINING.

I submit the opinion that there should not be that wide difference of feeling and want of sympathy between the so-called practical man and the scientific man.

What is more discouraging to a man of sound sense and determined energy than to know he has men about him who are continually pulling in opposite directions? Yet how perfectly cognisant are we that such negativeness, if I may use the expression, does exist, and that, too, among the uneducated classes.

Want of harmony in thought and action is one of the great evils standing in the way of young men becoming good and efficient engineers.

It is impossible for one man to comprehend everything, yet the purely scientific man disregards many things in the construction and proportioning of parts, which the practical man will consider indispensable, not from any particular theory of his own, but from an innate sense of that which is correct. The why and the wherefore he may not be able to explain, yet in actual practice he is right.

These differences among sections of our profession will grow less conspicuous with the advance of education, science, and art. And, however unconscious we may be of the fact, yet we are surely becoming more familiar with each other, just in proportion as we cultivate and interchange ideas with those with whom we are in daily contact, and who are mutually willing to profit by instruction. I feel the good time is coming when the mass of mechanics and miners will be both scientific and practical in a very large sense.

Many of our teachers are not sufficiently practical, otherwise they would point out and explain, more fully than they do, many very scientific and mysterious phenomena, educating the mind of the student to recognise if not fully to comprehend them, and in this way not only preparing him to theorise more correctly, but also enabling him to avoid laying himself open to the derision which often follows in case the theorist is proved in error.

The reading and understanding of drawing and the surveying and comprehending of machinery may, perhaps, be compared to the studying and speaking of languages: and in order to illustrate what I wish to convey I will state that a mere theoretical engineer will copy or perhaps construct an elaborate machine on paper, in which full lines, and dotted right lines and circles, are as familiar to him as reading and writing. He can explain the minutest detail of the machine, and how it should go together, and how be taken apart: yet place him beside the same machine as it stands completed, and he is bewildered. He can explain to you nothing, it may be, save the general construction, and his ideas of its practical construction are as clear as they would be on the compiling, setting the type, and binding of Homer's Iliad, all of which he may possibly have read, though he never knew absolutely how the work was put together.

On the other hand, show the aforesaid drawing to the hard-fisted mechanic, and it would be as unintelligible to him as Latin and Greek, for to him there is a confusion of many lines worse than any German text; but place him with the machine itself and he feels at home, and will explain to you its construction, dissecting any part in a straightforward mechanical manner, provided the machine has been designed practically and with care.

I call to mind an experience I once had in Chicago, Ill., in which city I was putting in some heavy foundations for machinery soon after the great fire. At that time every man who could work was pressed into service; men were getting high wages, and were constantly striking for either higher figures or fewer hours of labour. Hundreds of mechanics came from other cities, and circumstances conspired to make men arrogant and independent. Many of the men were rough characters, with whom it was necessary to deal firmly, otherwise they would not half work; and not only that, for had they had their own way a very bad example would have been set to those who were disposed to act fairly.

I soon found I had some half-dozen in my force that were of the rough sort; one even went so far as to attempt to take my life. The attack aroused my blood, and from that moment forward I never relaxed my will to show them my determination not only to take the lead, but that they must and should follow my instructions. The result was that long before I was through with that set of men, I could never lift my hand to do anything without their anticipating me; and of all the men I have since been in charge of, I can recall none that were more willing to do my bidding.

Always take the first lift yourself; by so doing you soon impress your men that to be appreciated they must be prompt, which is one of the main elements of success.

Young engineers, make it a point to put your "shoulder to the wheel" first, and soon the labourer will find that you have only to wish and you are obeyed. I repeat it, don't irritate your men. A boy often receives a fair common school education and goes into a shop; but by the time his apprenticeship is over, and he is prepared, so far as practical knowledge is concerned, to enter a technical school, his fine sensibilities are blunted, if not gone entirely. In very rare instances will a boy be found who can commence his schooling again with the right enthusiasm.

A condition necessary for obtaining admission to a technical school should be a certain time spent in studying works of practical utility. This desideratum would bring to the school young men of greater determination than are at present to be found in those establishments.

Masters of shops and foundries would object to taking a boy in their employ without obliging him to remain a specified time. This term will certainly be long enough to enable a master to derive some benefit from the boy to compensate the former for the bad and spoiled work of the latter. At the expiration of this period the boy will be so far developed that, should he choose to enter a technical school, he will be better fitted to imbibe those professional tenets which go to polish the engineer; and let the scholar ever bear in mind that the higher the polish the better will he withstand in after years the corrosive attacks necessarily incident to his career.

At all times it is a matter of serious consideration for one to choose the proper shops in which to place a boy, in order that he may have ingrafted into his mind those thoroughly practical ideas which will serve him advantageously in the future.

One of the greatest evils that can befall a youth who has the ambition to become prominent in the engineering profession, is to be placed in contact with, to say nothing of being under the tutorage of, an impracticable man, one who is full to overflowing with little whims, who is slack in discipline, who is wanting in dignity, who is never prompt, and who is incapable of placing before his men a class of work which can be understood and appreciated by the public at large.

To procure for a boy or young man a thoroughly practical education, first make a close investigation as to the best shops in which to apprentice him. Then pick out the foreman mechanic, whose high qualifications have secured him his important position in the works; place your boy under his charge and you may rest assured that when the boy has served his term of apprenticeship he he will have received a far better knowledge of his trade than if he had been allowed to select a shop for himself, and serve a short apprenticeship, without having received any practical instruction.

Under proper supervision a boy will generally profit both himself and his employer. Reverse the case, and the young man will almost invariably turn out to be a miserable botch and a nuisance, wherever he may chance to be employed.

[The above is extracted from a more lengthy paper in the *Engineering and Mining Journal* by the author, Mr. Orosco C. Woolson, inspecting engineer on the New York Elevated Railroad. Mr. Woolson has, it appears, recently obtained a patent on a flexible railway system, designed to obviate the noise and vibration on the New York city elevated railway structures.]

A GLANCE AT THE SCIENTIFIC WORLD OF FIFTY YEARS AGO.

AMONGST many articles of scientific interest, principally in the domain of natural history, the following pleasing communication has appeared in *Science Gossip*, signed H. F. Parsons:—

"Having had lately to consult the volumes of the *Philosophical Magazine* for 1829-30, I have been much interested by the view of contemporary science which they afford. The volumes record the death of four great lights of science, two of chemistry, Sir Humphry Davy, Dr. Wollaston, and two of astronomy, Dr. Young and the Marquis de la Place. They contain the last papers written by the two first named: that of Sir H. Davy on the electricity of the torpedo; that of Dr. Wollaston on a method of rendering platina malleable. The advance which knowledge has made since that date is of course especially perceptibly in geology. The writers of papers on that science seem mostly to look upon the literal accuracy of the Mosaic account of the creation and the Noachian deluge as an axiomatic truth in which the facts observed have to be made to fit. One writer repudiates the idea of mineral veins having their origin in fissures of the rock, and adopts an explanation similar to that of the Cromarty quarryman, who told Hugh Miller that when God made the rocks he made the fossils in them. Even geologists so philosophical as De la Bèche, Conybeare, and Lonsdale, stoutly maintain that the appearances presented by the rocks and the physical configuration of the surface cannot be explained by any forces now known to be in operation on the earth's surface, and call in the aid of 'débacles' (a word now as obsolete as the view which it embodies), or huge gushes of water, set in motion by the convulsions which produced the dislocations of the earth's crust known as faults. The difficulties which prevented the acceptance of the uniformitarian theory seem to be, first, an inadequate conception of the extent of past time (we find it maintained that valleys could not have been carved out by the erosive power of streams, since we find ancient British and Roman fortifications attesting by their perfect preservation that the form of the surface has remained unaltered since the time of their construction fifteen centuries ago); and, secondly, the phenomena known as 'diluvial.' The glacial theory had not then arisen to throw a flood of light upon the origin of such phenomena as perched blocks and transported boulders, carried far from their native mountains, yet lying in the midst of fine clay.

In natural history we find the natural system beginning to make headway against the overwhelming authority of Linnæus, an authority which it was looked upon as something little short of blasphemy to gainsay. We have heard of an entomologist who went through his cabinet and destroyed every specimen which he could not find described by Linnæus. So the medieval physicians declared that they would rather do wrong with Galen than do right with any one else. A Mr. Roscoe, who speaks in a tone of authority, declares that whatever may be the merits of Jussieu as a botanist, it is sufficiently clear that they are not exemplified in the superiority of his arrangement as a nomenclature for the vegetable kingdom. 'We are compelled to conclude that as a nomenclature and series of plants it is it is greatly inferior to that of Linnæus; and that however excellent it may be in some respects, it will never supplant in general use that long established work.'"

The author has some pleasantly written papers "On the Cultivation of Botany in England." The professor, in visiting England, was struck with the deep, full verdure of English vegetation. He had often heard and passed censures on the intense colours of the figures in English botany, but now perceived that the complaint was unfounded, the prevailing hues of vegetation being even of a deeper tone than there represented. He observed nothing in the flora of the roadsides which struck him as being different from that of Germany except *Ulex europæus* and "a species of *Rubus*, which, though called by all the botanists of this country *R. fruticosus*, is not the plant which bears that name on the continent, of which the corollas are always pale red." What a charming picture of simplicity! the critical botanists or "splitters" had not yet tried their hands upon this prickly genus. The professor is justly indignant because Sir J. E. Smith, the president of the Linnean Society, and the most eminent botanist in England, was formerly inhibited by the vice-chancellor of the university from delivering lectures on botany at Cambridge, because he was a Dissenter. However, the University of Cambridge is not alone in not always acting in a spirit of wisdom: for the University of Landshat falls in for censure in that, while it spends 6000 florins on its beer cellar, it allows its botanic garden to fall into decay. Kew Gardens, in pre-Hookerian times, did not impress our author favourably, but he was highly delighted with those of the Horticultural Society at Turnham Green, being apparently captivated by the delicious flavour of the peaches and pine-apples grown there. The British Museum of those days, the present building being then only just commenced, he considered a disgrace to an enlightened people. He notes the fondness of the English for flowers: "The poor Londoner, who cannot afford to buy what is beautiful, will still, if possible, obtain something to decorate the window with of his dark little attic, and give his last farthing for a bit of verdure." He is severe on the fiscal arrangements of those days, especially the window-tax and the duty on imported books. His herbarium being contained in some musty old volumes on law and divinity, he was charged thirty florins duty on them, to escape which he had to take out his specimens one by one and place them in papers bought for the purpose, and abandon his old folios to the Custom-house officials. He visited Oxford, performing the journey in six hours, though at the risk of breaking his neck. He speaks with warm admiration of English botanists, especially of Mr. Don, whose reputation does not stand so high as it then apparently did.

A curious example of the change which men's ideas have undergone in another department of human interest is afforded by a description of a "Parabolic Sounding Board" erected in Attercliffe Church by the Rev. J. Blackburn, minister of Attercliffe cum Darnall. The woodcut with which the paper is adorned shows a lofty pulpit of the "three-decker" pattern, surmounted by a huge erection like a dimidiated umbrella. This sounding-board was constructed on mathematical principles, and it was claimed that if the preacher's mouth was exactly in the focus of the parabolic surface, an attentive hearer would perceive an effect that might be compared to the gentle swell of an organ.

We find various things now familiar to us announced as novelties. We are told where "those curious substances bromine and bromide of potassium, which we believe have not been hitherto prepared in this country," may be obtained. Iodine has also the interest of novelty. There is a paper, now historic, by Dr. Robert Brown, "On the Movements of Active Molecules;" and we may read the speech of the President of the Royal Society on delivering a medal to Mr. Charles Bell for his discoveries of the functions of sensory and motor nerves, in which he says: "Of all the branches of human knowledge, anatomy has experienced the greatest difficulties in struggling against passions, prejudices, and superstitions." We may congratulate ourselves that the difficulties alluded to were in great measure removed a year or two later by the passage of the Anatomy Act; but the prejudice against the study of anatomy is not even yet extinct; and has it not been left to our present Parliament to prohibit in effect physiological research in the land of Harvey, Hunter, and Bell, at the instance of an ignorant and sentimental clamour, based upon the groundless statements of disingenuous agitators?

MILK AS A VEHICLE OF CONTAGION.

ALEXANDER R. BECKER, M.D., of Beverley, California, in the *New York Medical Journal*, makes the following noteworthy observations on the important subject above mentioned:—

Among the many questions now agitating the scientific world there is, perhaps, no one of more vital importance than the germ theory of disease, applied to the so-called zymotic diseases. These diseases are also attracting close attention on account of the fearful ravages caused by them every year in our cities, as well as in the rural districts. Any light which can be thrown on their origin and spread must, therefore, be hailed with satisfaction.

There is one source which we think has not been sufficiently insisted upon, although it has attracted more attention in England than in this country, and that is *milk*. How many householders ever think of enquiring where their milk supply comes from, or what are the sanitary conditions of the farm or dairy whence it comes? In several of the States there are "milk laws;" and some of our large cities have "milk inspectors," who examine the milk more or less carefully for "adulterations." But no care of chemical or microscopical examination can discover the infinitely more dangerous disease-germ or contagia. If the disease-germs be present in the water which supplies the dairy, they will surely get into the milk, either innocently, through the necessary washing of the cans, or wrongfully, through intentional "watering." Or, if they should be present in the atmosphere, they would naturally be attracted and absorbed by a fluid so rich in nitrogen and water; which would also afford them a pleasant resting-place until, by its consumption, they would reach an appropriate nidus.

In England several epidemics have been directly traced to the milk which came from the dairies where the water-supply was found to be contaminated, In one case—at Bolton—forty-seven out of fifty families supplied from the same dairy were smitten with typhoid fever. On examination, the water supply of this dairy was found to have been polluted by the dejections of a typhoid fever patient. (See paper by Dr. John Dougall, Medical Officer of Health for the Burg of Kinning Park, *Glasgow Medical Journal*, May, 1873, p. 312. Also, "Eighth Annual Report of the State Board of Health of Massachusetts," 1877, p. 122).

When we remember the utter carelessness which prevails in the country generally on the subject of drains and privies, and their position relative to brooks and wells, we must stand appalled at the resultant danger. And here we find a very probable origin of many of our city epidemics. Moreover, we see that, in order to make our milk-laws and milk-inspection effective, they must be extended so as to cover all milk-farms, with their dairy buildings, systems of sewerage, and water supply. This would of course be very unpopular with the farmers, and would entail considerable expense, as it would largely augment the labours of the State Board of Health.

But if the people could be brought to see (1) the enormous death-rate from the contagious fevers; (2), the great danger of drinking milk containing contagia; and (3), the strong probability of such contamination of their milk-supply, owing to their ignorance and carelessness of dairymen, the public opinion would soon demand the passage and strict enforcement of such preventive measures.

RECENT AMERICAN AND FOREIGN PATENTS.

Messrs. Thomas J. Lindsay, David A. Lindsay, and William J. Miner, of Windfall, Indiana, have invented an improved combined seed drill and corn planter for drilling seed or planting corn in two or more rows at once. The machine may be used for drilling or for planting in hills at will, without changing the parts.

Mr. Curtis H. Warrington, of West Chester, Pa., has devised an improved machine for marking land, which is so constructed that it may be readily adjusted to make the marks at any desired distance apart, which will allow the ploughs to be readily raised from the ground for convenience in turning around and in passing from place to place.

Mr. David F. Hacker, of Kempton, Ind., has patented an improved horse hay rake, which is automatic in its action, the teeth being raised by the wheels through a movable ratchet sleeve placed on the axle.

An improvement in the class of force-feed seeders and planters having a gauge or regulator for increasing or diminishing the flow of seed at will, has been patented by Mr. Alonzo Runyan, of Catawba, O. In this machine the regulator can be easily set to any desired amount of feed, and it always indicates the amount of seed the wheel is delivering.

An improvement in water guages for steam boilers has been patented by Mr. Erastus B. Kunkle, of Fort Wayne, Ind. This invention consists in scrapers or cleaners formed upon the valve stem of the water cock, to free the cock from scale. The valve has a vacuum chamber at the outer end of the water cock, to prevent the escape of hot water around the valve stem.

Mr. John D. William, of Rising Sun, has patented a burglar alarm, which is an improvement upon that form of burglar and fire alarm in which a clock mechanism is set going and made to ring a bell from the movement of a tripping device, which is released when one of a number of cords running to the various parts of a house is burned by fire or disengaged by the entrance of a burglar.

Mr. Robert W. Tavener, of West Bay City, Mich., has patented an improved lubricator or oil cup, designed to be attached to the steam chest of a locomotive, and depending for its automatic feed or operation upon the intermittent injection of steam into it. The cup is provided with valves for admitting steam and permitting the exit of the oil, and also for facilitating the discharge of sediment.

Mr. Wilson E. Facer, of Cleveland, Ohio, has devised an improved electric gas lighting apparatus, which, by the simple opening and closing of an electric current, turns on and lights the gas or shuts it off. It is designed principally for lighting street lamps, but is capable of application to other purposes.

Mr. John F. Cameron, of New York city, is the inventor of an improved air ship or vessel, which is claimed to be so constructed that it may be propelled and guided, or at any desired angle up or down, while carrying passengers and freight.

Mr. Floyd Heavener, of Laramie City, Wyoming Territory, has patented an improvement in clothes line reels, designed to wind up the clothes line when it is to be taken into the house, and to stretch the same taut when disposed for use.

Mr. Patrick H. Chilnress, of Waynesborough, Va., has patented an improved millstone driver. This invention relates to an improvement upon the millstone driver for which letters patent were granted the same inventor August 13, 1878, in which the driver was made in two pivoted sections, and their inner ends jointed together by forks formed upon the said inner ends of the driver sections and an interposed ring which encircled the spindle.

Mr. Eugene Vicaire, of Paris, France, has invented an improved device for transmitting motion, which is designed to destroy the effect of the inertia of the moving parts. It consists in a peculiar form of compound beam or lever provided with a counter weight.

Mr. Henry Pollock, of Fredericton, New Brunswick, Canada, has patented an improved thread cutting attachment for sewing machines, by which the thread may be cut quickly. The cutter may be instantly lowered below the table when not required for use.

Mr. John F. Seymour, of New York city, has devised a novel machine for drying sheets of postage stamps and other gummed paper or material, which saves the time, labour, and space required when the gummed sheets are dried in the usual way.

An improved automatic car coupling, that may be coupled without going in between the cars, the coupling link being held in the exact position for entering the connecting draw head, and adapted to couple with draw heads of cars of different heights, has been patented with Mr. Charles W. Cornell, of Wauseon, Ohio.

Mr. Henry Staib, of Blossburg, Pa., has patended a machine for finishing or rolling leather, which will permit the operator to control the pressure and apply the most power when it is needed—that is, at the time of greatest pressure. It will let off and free the leather from the operating rollers instantaneously.

Mr. William H. G. Savage, of Kingston, Ontario, Canada, has devised an improved permutation lock, in which the adaptability of the face plate in connection with the set screw furnishes a very simple means of setting the lock to any desired combination, and changing the combination to a new one whenever necessary.

Mr. Daniel O. Fosgate, of Red Wing, Minn., has invented an improved sulky plough of light but durable construction, that may be easily controlled and operated by the driver. It consists of a plough frame that is supported on angular axles, and capable of adjustment for being levelled by means of a sliding and slotted axle and suitable mechanism operated from the driver's seat. The plough frame is made with a bend at the rear part for holding the plough firm and steady at any height.

Mr. Martin Bock, of Hughesville (Drum's P. O.), Pa., has patented an improved clock case, in which a time movement, a striking movement, and an alarm movement are carried in and by a single frame, and enclosed in a case of neat appearance and of compact form and size; provision is made for operating and regulating the various parts from the exterior of the case; a cheap, substantial, and serviceable clock is produced, and several advantages are obtained.

An improved annealing furnace has been patented by Mr. Edwin H. Hill, of Worcester, Mass. This invention relates to an apparatus for annealing and spooling wire at one operation, while it is more particularly intended for wire used on reaping machines; it is also applicable to other descriptions of wire.

Mr. Ferdinand Diescher, of New York city, has patented an improved device for attachment to a bedstead to prevent children from falling out of bed. The invention consists in a number of strips of wood jointed together at their upper ends and having the lower ends spread out fan-like, and attached to the bedstead by means of a socket that receives the middle strip.

Mr. Philip Listeman, of Colinsville, Ill., has patented an improved gate, which is so constructed that it may be conveniently opened and closed by a person on horseback or in a vehicle. It is simple in construction and easily operated.

Morris Jacobs, of Fort Clark, Texas, has patented an improved padlock which cannot be unlocked by a key, in the ordinary manner, without a preliminary and peculiar manner in order to place the tumblers or locking bolt in the required position for contact with the bit of the key. The body of the padlock is made in two separate parts, the one being pivoted to the other, and capable of rotation (when released by spring catches) to change the position of the tumbler and bolt with reference to the key hole.

Mr. Seth Kethledge, of Center Point, Iowa, has patented an improved lumber measure, in which the motion of the spur wheel or toothed discs is transmitted to an indicator which has a reciprocating rectilinear motion longitudinally of the carrying frame or case. No adjustment is required for the purpose of measuring boards of different widths. Instead of a circular dial there is a scale marked with figures arranged in columns extending longitudinally on the surface of the carrying frame or case, and a separate column is provided for each of the different standard lengths of lumber.

Mr. Frederick K. Collins, of Butler, Ind., has devised an improved attachment by which the person sleeping or resting on a bed or sofa will be fanned, thereby insuring a more comfortable rest in hot weather. The invention consists of a bed cover or cloth that is hung to hooks at the foot end of the bedstead. The crank arms are operated by crank rod connection from a suitable clock train, so as to impart a fanning motion to the spread or cover.

Mr. Floyd Heavener, of Laramie City, Wyoming Ter., has patented an improvement in wind wheels, designed to render the same self-governing by causing the area of resistance which the wheel presents to the wind to be automatically varied in inverse proportion to the force of the wind, to render the action of the wheel uniform.

Mr. James Griffin, of Mendocino, Cal., has patented an improved saw guide, that may be adjusted by the operator when the saw is in the cut, which is of special advantage when sawing long timber, and by which the wear of the parts is taken up in easy manner, so as to keep the guide always in good working condition.

Mr. Charles Galigher, of Cairo, Ill., has partented an improved millstone curb and chop conveyer. In this contrivance the meal cannot choke up or become clogged, but falls freely from the vicinity of the stones as soon as it comes out from between them. Access of air is thus permitted to the stones, and the flour is not injured by detention between the grinding surfaces or by friction against the stone and curb.

M. Harrison W. Holley, of Hale's Ford, Va., has invented an improved machine for rolling and cutting tobacco, which consists essentially of three sets of pressure rolls, arranged successively close together, an endless feed belt passing through the first set of rolls, longitudinal knives on the seoond set, and transverse knives on the third set, all of said rolls being geared together, so as to press and cut the tobacco as it is carried through the machine by the endless belt.

An improved piano violin has been patented by Mr. Fradelshon Harris, of Louisiana, Mo. This is an improved musical instrument which combines the gamut of the violin with that of the violoncello or bass viol, so as to enable a single performer to simultaneously execute, by means of keys, both parts, which have been heretofore allotted to these separate instruments.

Mr. William Howe, of Brooklyn, N. Y., has patented an improved folding hammock supporter that may be readily carried about and readily set up in position for use; and it consists of three folding sections—a base section and two inclined side sections—that are stiffened by lateral rods and pivoted to supporting legs. The side sections and legs swing on the base section into folded or upright position, the side sections being secured in the latter position on the base section by means of locking devices.

Mr. Rudolf Sieg, of New Orleans, La., has devised an improved diffusion apparatus for extracting saccharine matter from sugarcane and other sugar-producing substances.

Messrs. Peter Schultes and Christian Walter, of Mendota, Ill., have patented an improved folding log for sofa bedsteads. It may be locked securely into position lengthwise along the frame of the swinging section of the sofa bed or lounge, or at right angles thereto, it being rigidly secured so as to prevent rattling and shaking when in use.

An improved cigar press has been patented by Mr. J. W. Sursa, of Venice, Ill. It consists of a bench adapted to receive one set of moulds of different sizes to be used, and furnished with a cam shaft, with which the required amount of pressure is brought to bear on the moulds.

Mr. William T. Keefer, of Newcastle, Pa., has patented a cheap and convenient device for stretching and holding clothes lines, and for other similar purposes. The stretching is accomplished by means of a lever, which is retained in position by a rack and pawl. Clothes line props are dispensed with, and the matter of putting up the clothes line is greatly facilitated.

Mr. John C. Banks, of Carlisle, Ky., has devised an improved filter. This invention relates to that form of filter which is provided with an automatic device for opening a valve to allow the sediment to readily pass away. The weight of the water not only closes the valve, but opens it also.

Messrs. E. D. Smith, C. C. Matson, and P. R. Martin, of Utica, Ill., have patented an improved toe weight for horses, which consists of a weight adapted to rest on the hoof, pivoted to the toe at an angle coincident to that of the hoof, which can be adjusted to the middle of the hoof or to either side, as may be desired.

An improvement in letters and numbers for signs has been patented by Mr. Joseph A. Bruce, of Brooklyn, N. Y. The letters and numbers are made of two or more thin layers of wood with the grain running in different directions, and provided with plates of transparent or opaque glass set in the openings. In some cases the glass is covered with an ornamental scroll work.

Mr. James C. Wright, of Louisville, Ky., has devised an improved form of counter or shelving for use in stores or shops, for the purpose of holding clothing and other goods, the construction being such that space is economised, the goods more easily protected, better displayed, and more conveniently accessible, and may also be more quickly moved in the case of fire than when placed on counters and shelves of the usual construction.

Mr. Sylvester Byrne, of Boston, Mass., has devised an improved washing machine for heavy fabrics, such as stair cloths, blankets, sheets, rugs, mattress covers, sheetings, and similar articles, which may, by being passed first in one direction, then in the oppposite direction through the machine, be cleaned rapidly.

Mr. Ephraim R. Dingley, of New York city, has devised an improved railroad track, in which the rail is provided with a concave rubber bearing block, extending around and over one side of the head of the rail, to destroy the side vibration of the rail and the ringing sound of the car wheels.

Mr. George W. Prescott, of Battle Creek, Mich., has invented an improved cone and fastenings for smokestacks of locomotive and portable engines. It is so constructed as to break up the cinders and prevent them from cutting the netting and smokestack without impeding the exhaust.

THE RAILWAY SYSTEMS OF SOUTH AUSTRALIA.

By R. C. Patterson, M. Inst. C.E.

The development of new countries by means of railways is the most important function of colonial governments. In the case of the Australian colonies, especially in Victoria, there has been an unwillingness to take advantage of the experience and practice of older communities; and the railway policy has been the principal feature characterising opposing parties in the Legislature. Prior to 1867, a gauge of five feet three inches had been adopted in South Australia, the lines costing considerably more than £10,000 a mile, and the permanent way being of a character entirely unsuited to the climate; but in that year, owing to popular agitation, a cheaper system was introduced. The existing gauge was extended, but of a much lighter type; and the three feet six inches gauge was introduced for districts separated from the broad gauge lines. An extension of the main line northwards from Adelaide for seventy miles on the broad gauge had cost £5,247 per mile. This line is of an easy character. The width in cuttings is sixteen feet six inches, and in embankments eighteen feet. The permanent way consists of wrought-iron flat-footed rails, weighing forty pounds to the yard, spiked to red gum hardwood cross-sleepers. Stations occur at intervals of about seven miles. Fencing is of cast-iron straining-posts and five rows of galvanised strand wire. The rolling-stock is of the usual character. The present average speed of trains is twenty-five miles per hour. The bulk of the traffic from the interior consists of wheat and wool. The total traffic, from the opening in 1870 to the close of 1877, was 573,931 passengers. The wear of the rails was due to a much higher rate of speed than contemplated. Other lines in South Australia of this character have been made and equipped at a cost varying from £5000 to £6000. Labourers' wages had been 8s. per day of eight hours, and masons, bricklayers, carpenters, and smiths, from 12s. to 13s. The character of the line on the three feet six inch gauge, had so far been definitely fixed upon as the type of all the pioneer northern lines of railway. The Port Augusta and Port Darwin Railway, to connect the Indian Ocean with the Southern Ocean, which would be about 2000 miles in length, afforded a good example of that type. The estimate for the first length of 200 miles from Port Augusta, including station buildings, water supply, workshops, and rolling stock, was £1,008,500, or £5,042 per mile; but the terms on which some of the contracts had been let, rendered it probable that the line would be constructed considerably under the official estimate. The ruling gradients were 1 in 60, with curves having a minimum radius of five chains. The highest altitude attained above the sea was 1,322 feet in the Flinders Range, twenty-nine miles from Port Augusta. The whole of the country is held by pastoral and mineral lessees, and excepting near Port Augusta, no land had to be purchased. Very little fencing is needed. The earthworks generally of a light character. The formation width in cuttings is twelve feet six inches, and in embankments fourteen feet. Considering the small rainfall (ten inches annually on the average), the bridges and culverts were numerous, there being 8,750 lineal feet of iron bridging, and 570 culverts of ten feet in diameter as a rule. The bridges have masonry abutments; the piers are formed of hollow cast-iron screw piles, and the superstructure of wrought-iron plate or lattice girders. The piles are filled with lime concrete; and for simplicity and economy, only twenty, forty, and sixty-feet spans had been adopted. The writer is of opinion that these branches are amongst the lightest and most economical ever constructed. The total weight of wrought-iron in a bridge of sixty-feet span, exclusive of the cross-head box girder was nine tons twelve and a-half cwt. with plate girders, and eight tons two and a-half cwt., where lattice girders occurred. The cross-head girder came to eighteen and a-half cwt. Lime concrete had been largely and successfully substituted for masonry in the walls, arches, inverts, and wing-walls of culverts, the cost being less than one-half the expense of corresponding culverts in masonry. The culverts are of two types, arched and open-topped. The proportions of the concrete is one part of fresh unslaked lime well ground, two parts of clean sharp sand, and three parts of gravel. The precautions were necessary in building the culverts with concrete. The permanent way consisted of flat-footed rails of wrought iron, weighing 40 lbs, to the yard, spiked to Jarah-Jarrah cross-sleepers, imported from Western Australia, spaced two feet nine inches apart from centre to centre, and having a layer of six inches of gravel ballast under under the sleepers. The locomotives, which are supplied with a bogie arrangement, were constructed by Messrs. Beyer, Peacock, and Co. The carriages are of the second class only. They are entered through doors at the ends. The seats are athwart the vehicle, with a central passage between them, and they can accommodate thirty passengers each. The roofs are double. The bodies of the carriages are of Australia timber, which, when seasoned, was but little influenced by extreme changes of temperature. The wheels are of wrought iron, the tires and axles of cast steel. The axle-boxes are Beuther's, and the stock is fitted with central buffers. The waggon-stock is made up of low-sided, medium, and covered vans. Each truck is limited to carry a load of six tons. The ratios of tares and loads are, for the low-sided wagon, 1 to 2·105; medium wagon, 1 to 1·905; covered van, 1 to 1·714. Well-equipped stations occur at intervals of about twenty miles. The water-supply includes the construction of large covered concrete underground tanks, each with a capacity for 600,000 gallons, with overhead tanks and steam pumps. The writer admits the evils of the break of gauge. Queensland had adopted a gauge of three feet six inches; New South Wales, a gauge of four eight and a-half inches; Victoria, one of five feet three inches, and South Australia had gauges of both extremes.—[Abridgment of Paper read by Mr. Patterson at the Institution of Civil Engineers.]

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President, SIR ANTONIO BRADY.

SESSION 1878—1879

Members' Meetings—at 8.15 p.m.—

Thursday, February 6th, the Promotion of an Inventors' Department at the Agricultural Show, 1879.

Thursday, February 27th.—"The Electric Light."

Executive Council Meeting at 7.30 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

EXECUTIVE COUNCIL.

On the 23rd January the Executive Council met, Mr. F. H. Varley, Chairman Executive Council of the Institute, occupying the chair, and after the transaction of financial and general business, it was resolved that it would be desirable to organise special action by the Inventors' Institute to obtain a distinct Inventors' Department at the Agricultural Show arranged to be held in Hyde Park in August next; and, further, that it is desirable the matter be taken into consideration at the next meeting. And the Secretary was directed to take steps by communication with the President, and otherwise to give effect to this resolution.

MEMBERS' MEETING.

At the meeting 23rd January the Electric Light was brought before the members by Mr. F. W. Campin, the Secretary, who read a paper which is fully set forth in another column.

Monthly Notices.

Machines for cutting coal underground are now no novelty, but it appears to be likely that the practicability of working coal-cutting machinery, and other underground machinery, by electricity will be tested shortly, as a number of leading colliery proprietors, after witnessing some experiments with a Siemens dynamo-electric machine at Wigan, appeared inclined to enter into the matter. At present compressed air is the only power that can be used without interfering with the ventilation of the collieries.

The next Actonian Prize will be awarded for an essay on "The Structure and Functions of the Retina in all Classes of Animals, viewed in relation with the Theory of Evolution." The value of the prize is one hundred guineas, and it will be awarded or withheld as the managers of the Royal Institution shall think proper.

Japanese Coal.—The Japanese Government offer a subvention of seven millions and a half of francs for the exploitation of the coal basin of the island of Yeso. The richness of this coal deposit is spoken of as something remarkable.

The obituary list of the Royal Society for last year contains remarkable instances of longevity. Dividing the twenty-one deaths into three groups, the first begins with a comparatively young man, Col. Montgomerie, age 48, then leaps up to Dr. Oldham, 60; Dr. T. Thomson and Col. Cameron, each 61; Prof. Harkness, 62; Rev. W. B. Clarke and Sir Andrew Waugh, 68. In the second group, ranging from 70 to 78, are Rev. R. Main, Rev. Dr. Booth, Admiral Sir W. H. Hall, Mr. J. Penn, Dr. W. Stokes, Mr. E. B. Beaumont, the Dean of Peterborough, and Mr. Thomas Grubb, whose large telescopes in Europe and at the antipodes remain as memorials of his skill. In the third group we find Mr. C. W. Johnson, 80; Sir George Back, 82; Lord Chelmsford, 85; and Earl Russell, 86. The veteran Sir Edward Sabine still ranks as the father of the Society. The Society's foreign list confirms the assumption that science is favourable to long life: Regnault died at 77; Fries, the Swedish botanist, at 84; and Becquerel at 90.—*Athenæum.*

A new Indicator for Acids.—The detection of minute traces of acid is a matter of great importance in the examination of malt and beer worts. We have on several occasions recommended brewers to adopt a method of testing malts by determining the amount of free acid they contain; and for this purpose a solution of litmus is usually used, which turns red in the presence of free acid and blue when the solution is rendered alkaline. Unfortunately litmus is not sufficiently delicate as an indicator. Lately another substance has been recommended; we allude to phenol-phthalein. Its neutral and acid solutions are entirely colourless, but by the faintest excess of alkali an intense carmine colour is developed. This colour is discharged with equal readiness by the addition of sufficient acid to render the solution neutral; the colour is developed by all alkalies and discharged by all acids, including carbonic acid. Drew has experimented on this substance, and avers that it is greatly superior to litmus or any other indicator. We hope some firm will soon be able to offer this valuable material, as such substance is much wanted by analysts.—*Brewers' Guardian.*

The Mechanical Power of Combustion.—With all our modern inventions there is an enormous waste in our present system of burning fuel, although we are now far in advance of what was achieved some twenty-five years since. It has been calculated that with a boiler and engine of good construction one-horse power is produced with an expenditure of 2 lbs. of coal per hour; but this is very far from what ought, theoretically, to be produced. The heating power in one pound of pure carbon, if burnt under the most favourable circumstances, is 14,000 heat units; and taking coal, and allowing for it not being pure carbon, we may say one pound is equal to 12,000 heat units. This amount of heat is equivalent to a force capable of raising 9,264,000 lbs. through one foot of space; 2 lbs. of coal will therefore equal 18,528,000 foot pounds. Now, it has been found that the work done by a one-horse power engine in one hour is equal to raising only 1,980,000 lbs. through one foot of space. Therefore, by our present methods of combustion it appears that only about one-ninth of the heat capable of being produced from the fuel is really utilised. Here is an enormous field for the intellect of our engineers.

The Scientific Review.

FEBRUARY, 1879.

REVIEW OF NEW INVENTIONS FOR ELECTRIC LIGHTING.

As affording a comprehensive view of current inventions in electric lighting, we present our readers with a transcript of Mr. Campin's paper read at the Inventors' Institute on 23rd January:—

In bringing the subject of the electric light before you, I feel, not being a professed electrician, that I have undertaken a task which, in all fairness, I must state that I am scarcely competent to fulfil; but I have thought that it would not be undesirable that some one having a general acquaintance with the subject, and, as a non-specialist, a right to claim an untrammelled position, should come forward to place before my brother members of the Inventors' Institute and the public a tolerable account of how the whole matter stands.

Although electric lighting has now become a question of the day, it is nevertheless a matter that engaged the attention of scientific men and inventors a great many years ago, and with so much effect, that there are not wanting amongst us men of science who assert that the electric light question has not much advanced beyond the position that it occupied a quarter of a century ago. However, I cannot agree with this view of the matter. It may be quite true that the main principles of the scientific applications involved in electric lighting are not different to what they were understood to be formerly, but there are certain questions which are of the utmost importance to the practical realisation of the electric light that are only at the present time beginning to be thoroughly understood and grappled with.

As far as I am able to judge, the inventors in this domain of practical science in bygone years did not fully appreciate the very powerful electrical apparatus that would be needed to make the electric light a success; nor did they fully apprehend the difficulties to be overcome in so working the electrodes or points for giving off light, as to afford a constant and equable illuminative effect.

If I may be here allowed a digression, we have, in the case we are now dealing with, another exemplar of how the grandest thoughts of men who are said to be in advance of their time evaporate, so to speak, in simple theorizing, because the progress of practical science generally is not able to support their new ideas with the practical means of giving them effect. In the case we are now dealing with, this appears to be very certain, for it is only recently that anything like a reliable electric light has been produced for public use. Thus much for general observations, and as the subject is crowded with practical points and considerations, I will at once pass to them.

Perhaps it will not be wrong to give the first place of prominence to Jablochkoff's invention, which has for some time been practically tested and achieved a considerable measure of success. It is hardly necessary to enter into a description of this invention, as probably all those who have taken any interest in the subject are aware that it consists substantially in the use of two parallel electrodes or conductors placed in the same vertical line side by side with an insulating substance interposed, the two electrodes being connected by a bridge which serves the purpose when the current is passed through the conductors of forming the electric arc, which is maintained as the carbons burn away.

The next invention may be said to be that of Lontin, which is the one adopted at the Gaiety Theatre. Bearing upon the same part of the question may be said to be Rapieff's, in which two pairs of electrodes, or carbon points, each pair forming a V, the V ends being brought together affords the necessary electric spark or light. This is the form of electric lighting adopted at the *Times* printing house.

The next that may be mentioned is Werdermann's light, in which a single electrode or carbon point is brought up to a block of carbon which forms the negative pole, the proportion being in area as 64 to 1.

Edison's invention, whose name the public has seen so much paraded, is at present a somewhat unknown quantity. From what has transpired it appears that the light is produced by incandescence of metals, such as iridium and platinum, and as to this, it may be remarked that Mr. F. A. King obtained a patent in 1845 which appears to have been based on the same principle. Whether the mode in which Edison works out this idea is substantially different from that of King, one is not in a position at the present moment to determine,

It is very difficult to select from the large number of inventions which have been put forward on the subject of electric light—those which are really of importance—since the list for the period between 20th October and 20th December, 1878, comprises the considerable number of applications following:—

C. W. Siemens, 4208. Sir C. T. Bright, 4212. T. A. Edison, 4226. E. J. C. Welch, 4278. J. E. Stokes, 4283. C. E. Shea, 4304. A. A. Cochrane, 4313. B. P. Stockman, 4315. F. D. Tilleard, 4317. C. W. Harrison, 4338. J. S. Wilson, 4347. S. F. van Choate, 4388. T. A. Bell, 4403. F. H. W. Higgins, 4456. H. L. Thomas, 4462. C. Stewart, 4466. F. Gye, 4473. G. R. Bodmer, 4476. E. G. Brewer (com.), 4502. M. Gray, 4553. C. Davis, 4559. J. Mackenzie, 4568. G. Zanni, 4573. H. W. Tyler, 4575. C. F. Heinrich, 4595. E. Edwards and A. Normandy, 4611. S. G. L. Fox, 4626. E. J. C. Welch, 4635. J. S. Sellon, W. Ladd, and H. Edmunds, 4645. J. S. Sellon, W. Ladd, and H. Edmunds, 4646. J. T. Sprague, 4662. W. L. Scott, 4671. E. J. C. Welch, 4689. J. H. Johnson (com.), 4690. A. Reunenschneider and T. S. Christensen, 4693. F. Cheesbrough, 4705. J. L. Pulvermacher, 4744. R. Sabine, 4321. F. J. Cheesbrough (com.), 4847. C. W. Siemens (com.), 4949. A. V. Newton (com.), 4960. S. P, and W. P. Thomson, 4988. S. Cohne, 5011. J. H. Johnson (com.), 5044. J. H. Johnson (com.), 5053. A. V. Newton (com.), 5060. R. Punshon, 5105. J. H. Johnson (com.), 5110. M. B. Brain, 5139. G. Whyte, 5152. A. M. Clark (com.), 5165. W. R. Lake (com.), 5183. H. Wilde, 5197.

However, passing again to inventions which have obtained some public prominence, we may mention the Lontin arrangement. This appears, according to a pamphlet by Mr. Sprague, to comprise two separate parts, so arranged as to provide several distinct circuits to work separate lights. Serrin's regulator is used, but M. Lontin claims to have effected some improvements therein.

The Siemens light as recently exhibited at the Society of Arts appears to be simple in construction, and is worked by a continuous current, as distinguished from the Jablochkoff candle already referred to, which requires somewhat rapid alternation. The driving power for this light is supplied usually by a Siemens combination engine, consisting of a small steam engine and an electrical machine mounted on the same plate. This light, it may be observed, is now in use at the lighthouse at the Lizard. Another point in regard to it is the application of an automatic contrivance to ensure the self-adjustment of the carbon points.

The Gramme machine is probably better known than the Siemens machine. Its chief characteristic is the employment of a soft iron ring as an armature. It is formed of a number of iron wires, insulated copper wire being bound round the ring in separate coils, the ends of each coil being connected with a slip of copper which is prolonged beyond the ring itself. The ends of the copper slips thus find their way to the axis on which the ring rotates to which they are fastened, separated from one another by a strip of silk or other non-conducting material.

The Lontin, Wild, and duplex Gramme admit of several currents being taken from the machine. They all have a separate machine for generating the currents, from which the same are passed off in one continuous direction to the second or dividing machine, which, after greatly augmenting their intensity, permits of correction off its exterior casing in a divided form, and alternating in action. In the case of the Lontin machine it is stated they can be subdivided almost at will. The Wallace-Farmer, and Higgs's machines seem to possess the same advantages, and admit of several lamps being worked in a circuit.

There are several other inventions which ought to be brought under notice of the meeting, but up to the present time I have been unable to get such descriptions as to them as to lay before you what I consider reliable information.

Our respected members, Mr. F. H. Varley, Mr. John T. Sprague, and Mr. St. George Fox, have each of them patents in progress, from which much is expected, but as nothing is yet published as to these inventions, I can do no more than make this statement.

With regard to the lamps for the electric light, Messrs. Sawyer and Man have some important improvements, of which a full account has recently been published in the *Scientific American*, from which I will now quote:—

The economical division of the current, or more correctly the light produced by a single current—popularly believed to be very difficult if not practically impossible—has been successfully worked out by several American investigators. As long ago as 1875, Mr Moses G. Farmer, now Electrical Superintendent of the U.S. Naval Torpedo Station, at Newport, R.I., subdivided the electric current, produced by a small machine, into forty-two different branches, putting a light to each branch. Mr. Sawyer's system appears to be able to do the same indefinitely through the maintenance of a uniform resistance throughout the circuit and equal resistances in the several parts of the circuit, as will be shown further on.

The adaptability of this form of electric lighting to the needs of household illumination is indicated. The light produced is pure, strong, and yet soft, like sunlight. It is, moreover, steady and cool. It is not influenced by air currents, and it does not vitiate the air by poisonous products of combustion, nor by withdrawing the vitalising oxygen. The lamp takes up less room than the glass shade of a gas jet, and no more than the chimney of an oil lamp. To a limited extent, also, it is portable, and may be used as a drop light. The light is produced by the incandescence of the slender pencil of carbon. The light-giving apparatus is separated from the lower part of the lamp by three diaphragms, to shut off downward heat radiation. The copper standards lower down are so shaped as to have great radiating surface, so that the conduction of heat downward to the mechanism of the base is wholly prevented. As to the structure of the base, no detailed description of this portion will be required, further than to say that the electric current enters from below, follows the line of metallic conduction to the "burner," thence downward, on the other side, connecting with the return circuit. The light-producing portion is, of course, completely insulated, and also sealed at the base, gas tight.

A fatal defect in all previous lamps depending on incandescent carbon has arisen from what has been called the "vaporizing" of the carbon. This Mr. Sawyer holds to be an absurdity, since the carbon is not even fused. The wastage of the carbon in mercurial vacuums, and in atmospheres of compound gas, is due, he holds, to chemical decomposition. Many gases, indifferent to carbon at ordinary temperatures, attack it destructively at temperatures obtained in the electric lamp; and the process is continuous, the carbon taken from the burner being redeposited on the glass case, and gas left free to continue its depredation. Mr. Sawyer claims to have overcome this difficulty by his method of charging the lamps with pure nitrogen, and by providing for the fixing of any residual oxygen left in the lamp. In this way an unwasting carbon is secured. Another stumbling block on which other workers in this field have come to grief, has been the crumbling or disintegration of the carbon burner, due to sudden heating when the lamp is lighted. This is avoided in the Sawyer-Man lamp by an ingeniously devised switch. By this means it is impossible to turn the current on or off suddenly, to the disruption of the carbon. This, however, is not the only nor the chief advantage of the switch. It is, indeed, the key to the entire problem, the indispensable condition, Mr. Sawyer holds, of practical electrical distribution.

It is well known that an electric current will exactly and readily divide among circuits of equal resistance. Accordingly, if the resistance of a sub-circuit be maintained constant, no matter what may be going on in it, whether a lamp is not lighted at all, or lighted to a mere taper, or to any intermediate stage up to full brilliancy, it is obvious that no other lamp or lamps in that circuit will be affected.

Thus it is that the the greater part of the illumination is the product of a small part of the current. When the light is well on, a very slight increase in the current increases the light enormously. It is here that the great loss occasioned by dividing a fixed current among several lamps finds its explanation. A current that suffices in one lamp to produce a light say of 100 candles, will, if divided between two lamps, give in each perhaps no more than 10 candles, or even 5, making a loss of 90 candles in the sum total. But if the current be doubled, each lamp will give a light of 100 candles, and the sum total will be 200 candles instead of 10. Having brought a candle, or a system of candles, up to the point of feeble incandescence, a (proportionally) small addition to the current will make them all brilliant. If at 6,000° Fah. a given carbon will produce a light of 3 candles, at 12,000° it will give 9 candles, and at 24,000° it will give 81 candles; the illuminating power increasing with vastly greater rapidity than the temperature.

The wires supplying the current may be run through existing gas pipes, each lamp being provided with a switch placed conveniently in the wall, and by simply turning a key the light is turned up or down, off or on. So long as the house is connected with the main, it makes no difference to the producer whether all the lights are on or off, since the resistance of the entire (house) circuit must be overcome, though it will to the consumer, since a meter records the time that each lamp is on, and the charge is rated accordingly. If the Dynamo-Electric Light Company can supply the illuminating force so cheaply that the constant and brilliant illumination of all the rooms of a house can be secured at no greater cost than the partial and intermittent illumination now had from gas, it is obvious that the electric light will score an important point. The cost of lamps and switches, it is claimed, will not exceed that of gas fixtures.

The meter above referred is a simple clock arrangement, with an attachment designed to throw the dial hands into connection when a light is on. From each switch a pair of conducting wires are run to opposite studs on the wooden disc. When no current passes through the lamp the revolving spring turns without making any record. When the current is on, one electric connection at each revolution is made through the pins assigned to the particular lamp, the armature of the magnet is moved, and the recording wheel is advanced one notch. This meter does not measure the quantity of electricity passing, but only the time a lamp is on. If two or any larger number of lamps are on, an equal number of connections are made at each revolution of the wheel, and the record wheel is advanced to correspond. This registration is, of course, a mere matter of business detail. In view of the well-founded dislike to gas meters, however, it would seem to be desirable to dispense with such devices entirely, and the nature of electric distribution appears to favour other and less objectionable modes and means of determining the financial relations of producers and consumers.

The method proposed for general distribution may be thus described: Where the main is tapped for a sub-circuit, a shunt is introduced so as to throw so much of the current as may be needed into the derived circuit. The resistance of say 100 added lamps will be about 100 ohms. By giving to the shunt a resistance of one ohm, one-hundredth of the current will be diverted, and the lamps supplied. When a large number of lamps are required in a circuit, a combination of the two plans indicated is supplied.

The diversion of any portion of the electric supply into an added circuit, whether one house or a group of houses, necessarily increases the aggregate resistance of the electric district, and calls for more work from the generator. To meet such contingencies automatically, Messrs. Sawyer and Man have invented and patented a regulator, which responds instantly to any increase or diminution in the demand, thereby securing an absolutely uniform volume of current.

This regulator so controls the steam or other power actuating the generator of electricity, that the amount of power supplied is increased or diminished in exact proportion to the demand, either by changing the volume of steam produced, or by coupling on or detaching different generators or parts of a single generator in circuit.

With regard to the cost of this mode of electric lighting no positive figures can be given. It is claimed to be entirely demonstrated that one horse power will give by the Sawyer-Man system of incandescence a light of thirty five-foot gas burners per hour. Where large powers are employed the cost of steam power, every item included, is commonly rated at one cent per horse power per hour. The cost of 150 feet of gas at New York rates is 41 cents, which would make the gas over forty-fold dearer than the Sawyer-Man light. Mr. Sawyer does not stand on this estimate, however, holding that even if the electric light should prove in practice on a large scale to be ten times as costly as calculation indicates, it will easily compete with gas, the light furnished being so much better and purer.

It is promised that facilities will soon be offered for the photometric test of a large number of lights, in a circuit, with dynamometric tests of the power employed in generating the electric supply. This, as already noted, is all that the system lacks to prove itself an accomplished economical fact.

Reverting back to machines, the Wallace-Farmer machine claims special attention, because it is the one patronised by Mr. Edison in his researches in electric illumination. It has lately been tried in this country, and, from what I hear, its performance is very satisfactory. It is provided with two electro-magnets, between which is a shaft carrying a revolving armature, consisting of an iron disc, bearing near its edge a series of twenty-five coils. Each coil is wound with four wires, so that in one revolution of the armature there are no less than 100 induced currents.

Here we may notice for a moment a machine called the "Brush" machine, which, like the one just referred to, is in high repute on the other side of the Atlantic, but it does not appear to have yet found its way into Europe. It is described as consisting of two electro-magnets, with a revolving armature of the ring form similar to that in the Gramme machine, from which, however, it appears to differ in many important particulars.

I have now placed before you a cursory view of various plans of electric lighting hitherto brought before the public, and although I have been unable to do more than present you with a mere sketch, yet, as it has been arranged that the subject will again be brought before the Inventors' Institute at no distant date, I trust I have done enough to pave the way to a full and detailed consideration of the subject in a scientific and practical point of view. However, before concluding my reading, I suppose I shall be expected to say something as to the expense of the electric light and its position as a rival to modes of lighting hitherto practised—gas in particular. As to comparative expense, I see no data sufficiently exact to enable me to make anything like a determinate statement; but I have such a confident hope in the progress of invention that I expect that the electric light will, all things considered, be found to be for many purposes no dearer than gas, whilst it will afford us a better and purer light.

At the conclusion of this paper, the Chairman of the evening, F. H. Varley, Esq., Ch. Ex. C. Inventors' Institute, made some appropriate remarks, which were followed by a discussion in which Messrs. M. Zingler, M'Lauchlan, and T. Morgan took part.

FOREIGN SCIENCE.

At a recent meeting of the French Academy of Sciences the election of a new member for the medical and surgical section, in the place of the late Claude Bernhard, took place. There were four candidates for the vacancy, and the election eventually resulted in favour of M. Marey.

A Dictionary of Chemistry (pure and applied) by M. A. Wurtz has just been published by a Paris firm.

Some communications have lately been addressed to the French Academy of Sciences of Paris by M. Boussincocq on the subject of Dalembert's well-known problem relating to the deformations or changes of form and structure experienced on an elastic or feeble surface when any pressure whatever is brought to bear upon it. He has also had some correspondence with the Academy regarding another problem correlative to that mentioned on the methods pursued for obtaining and maintaining an equal division of pressure on all points of a level surface comprised within a given or determined space, and has, we understand, brought forward some very able and clear demonstrations in these matters.

The following papers, among others worthy of observation, were read at the Anthropological section of the Vienna College of Science, recently held in that city, viz., "On the Action of Chloroform and Ether on Respiration and Circulation," by Dr. Philip Knoll; and "On some Ethnographical Charts of Turkey in Europe," by Dr. A. Boae.

Some valuable improvements and modifications on the Holtz induction machine have been devised and applied by Mons. F. Pierucci. They have been tested, and have given very good results.

A rather curious effect is stated to have been produced in the Avenue de l'Opera in Paris during the recent snowstorm, when the powerful rays of the electric light, in combination with the reflecting properties the snowflakes themselves, quite dissipated the obscurity occasioned in the atmosphere by the falling snow.

A project is on foot for the construction of a new line of railway through Australia, which it is anticipated will considerably expedite the passage from the northern parts of the colony to the seaport towns on the south and west coasts.

The Japanese Government are offering grants of large sums of money for the exploration of the collieries in the Island of Yeso, which are expected to yield almost as great a quantity of coal as is produced from the English mines.

Some calculations made from observations by Mons. G. Becka, of Vienna, on the orbits of comets, and published in a recent numbar of our contemporary, *Les Mondes*, are worthy of attention.

Correspondence.

INVENTORS' RIGHTS.

TO THE EDITOR OF THE SCIENTIFIC AND LITERARY REVIEW.

SIR,—At the last Inventors' Dinner, I was rather surprised that some of the speakers did not more fully enter into the matter of Inventors' rights as compared with authors' rights; and had it not been for a sudden indisposition, I should myself have enlarged somewhat upon the idea which was thrown out in this direction. Will you now, therefore, kindly allow space for this letter in your valuable medium.

Civilisation has recognised and established the rights of the author; and these are of much longer duration than those of the inventor. Yet the latter leaves his ideas to posterity in his specification, and is, therefore, an author; but, in addition to this, he has to carry his ideas into practice. And when he is doing this he is only at the commencement of his troubles and sacrifices; for when all seems clear before him, and his specification is written, he is yet liable, especially if financially weak, to fall a prey to someone crafty enough to speculate upon his ideas. He has often to submit to extortion from capitalists, who imagine that an inventor should be satisfied with honour alone; and who, even before any success has been obtained, reduce his pecuniary share in the undertaking to such an extent as to damp his ardour and crush the spirit necessary for the execution of the invention. And sometimes this reducing process is carried on to such an extent as to be fatal both to the invention and the inventor.

The latter, in order to carry out his purpose, often requires costly appliances and tools of an original character; and thus much time and labour have to be expended before he can complete his invention.

And whilst he is sowing, and the capitalist is reaping, it frequently happens that many years of his patent pass away; so that when he finds himself really able to derive benefit from his labours he finds also that his patent has nearly run out.

From this point of view, equal justice should be meted out to inventors and to authors in regard to the duration of their respective rights; and this without any fear of the remote contingency that either should become a millionaire.

I am in the sere and yellow leaf, have passed through all this dull and hard experience, and now at, I may say, the eve of life, I can have no interested object when advocating the cause of young inventors, and in the interest of this truly deserving class I maintain that if the patent laws are to be improved, prominence should be given to the necessity for prolonging the duration of patents rights, as well as to the other plans and suggestions put forward. By this means it may be hoped that progress will be aided through justice and equity. Wishing you every success, I am, &c.,

J. L. PULVERMACHER,

194, Regent-street, W.,
Jan 1, 1879.

IN Berlin a telegraphic museum has been opened in connection with the General Post Office.

Proceedings of Societies.

ROYAL SOCIETY.

DEC. 5TH.—W. Spottiswoode, Esq., President, in the chair.—The Hon. Sir J. Cockle and Lord Lindsay were admitted into the Society. The following papers were read: "On the Illumination of Lines of Molecular Pressure, and the Trajectory of Molecules," by Mr. W. Crookes. A dark space environs the negative pole of an ordinary vacuum tube whenever a spark from an induction coil is passed through it. Mr. Crookes has made many experiments in this dark space, which appears to offer a promising field for research to the physicist, and has succeeded in illuminating or making visible a "layer of molecular disturbance," which is identical with the "invisible layer of molecular pressure or stress," that has engaged his attention during some years. Remarkable effects are produced by long continued exhaustion of the tubes or globes subjected to experiment. The velocity of the imprisoned gaseous molecules is so greatly accelerated that light is produced as they strike against their walls of glass. A line of molecular force can be diverted or twisted by a magnet; and if the negative focus be so arranged as to fall on a strip of platinum foil, the strip melts. An ultra-gaseous state of matter may be set up, until, as Mr. Crookes remarks, "the phenomena in these exhausted tubes reveal to physical science a new world —a world where matter exists in a fourth state, where the corpuscular theory of light holds good, and where light does not always move in a straight line; but where we can never enter, and with which we must be content to observe and experiment from the outside." "Descriptions of a Machine for the Solution of Simultaneous Linear Equations," by Sir W. Thomson.

JAN. 9.—W. Spottiswoode, Esq., D.C.L., President, in the chair.—The following papers were read:—"Researches on the Action of Organic Substances on the Ultra-Violet Rays of the Spectrum," by Mr. W. N. Hartley; "On the Electro-Magnetic Theory of the Reflection and Refraction of Light," by Mr. G. F. Fitzgerald; "On Dry Fog," by Dr. Frankland; "Note on the Inequalities of the Diurnal Range of the Declination Magnet as Recorded at the Kew Observatory," by Mr. B. Stewart and W. Dodgson; "and "Some Experiments on Metallic Reflection," by Sir J. Conroy.

JAN. 16.—W. Spottiswoode, Esq., M.A., President, in the chair.—The following papers were read:—"On some Points connected with the Anatomy of the Skin," and "On Hyaline Cartilage and Deceptive Appearances produced by Reagents and Observed in the Examination of Cartilaginous Tumour of the Lower Jaw," by Dr. G. Thin; "Volumetric Estimation of Sugar by an Ammoniated Cupric Test giving Reduction without Precipitation," by Dr. Pavy; "On the Effect of Strong Induction Currents upon the structure of the Spinal Cord," by Dr. W. M. Ord; and "Concluding Observations on the Locomotor System of Medusæ,' by Mr. G. J. Romanes.

GEOGRAPHICAL SOCIETY.

DEC. 9TH.—Right Hon. the Earl of Dufferin, President, in the chair.—The following gentlemen were elected Fellows: Major Sir N. W. Drummond Pringle, Lieut.-Colonel H. T. Butler, Capt. A. W. Jamieson, Capt. R. G. Tosswill, Capt. G. C. Childs, and Messrs. J. F. Arnold, W. Bose, W. Lawson, J. Kendall, E. Pierce, and T. Taylor. The papers read were: "The Swedish Arctic Expedition," "The Dutch Arctic Expedition," and "The Route for Future Polar Discovery," by Mr. C. R. Markham.

JAN. 13.—Major-Gen. Sir H. Rawlinson, V.P., in the chair.—The following gentlemen were elected fellows:—Major-Gen. W.

C. R. Macdonald, Messrs. J. Caudwell, W. G. A. Grant, A. MacGregor, R. J. Moffat, W. J Pridham, and E. H. Pringle. The papers read were, "A Journey through Cyprus in the Autumn of 1878," by Mr. J. Thompson; and "Recent Information from Victoria Nyanza," by Mr. E. Hutchinson.

GEOLOGICAL SOCIETY.

DEC. 4TH.—H. C. Sorby, Esq., President, in the chair.—Rev. W. H. Allen, Rev. W. Downes, Dr. J. Drew, Messrs. G. G. Butler, J. Dixon, A. T. Metcalfe, E. P. Monckton, A. J. Mott, P. L. Sclater, W. H. Shrubsole, and A. Thuey were elected Fellows: "On some Mica-Traps from the Kendal and Sedbergh Districts," by Prof. T. G. Bonney and Mr. F. T. S. Houghton; and "Pleistocene Notes on the Cornish Coast near Padstow;" and "On the Pleistocene History of Cornwall," by Mr. W. A. E. Ussher.

JAN. 8.—H. Sorby, Esq., President, in the chair.—Messrs. C. B. Brown, C. Fischer, and W. C. P. Medlycot were elected Fellows; and Dr. F. V. Hayden, Washington, and M. J. Marcou, Salins, foreign members. The following communications were read:—"On some Tin-deposits of the Malayan Peninsula," by Mr. P. Doyle; "Description of Fragmentary Indications of a huge kind of Theriodont Reptile (*Titanosuchus ferox*, Owen), from Beaufort West, Gough Tract, Cape of Good Hope," by Prof. R. Owen; and "Notes on the Consolidated Beach at Pernambuco," by Mr. J. C. Hawkshaw.

BRITISH ARCHÆOLOGICAL SOCIETY.

DEC. 4TH.—Mr. T. Morgan in the chair.—Mr. Syer Cuming reported the discovery of ancient relics on the site of the Fleet Prison, and Mr. Way exhibited some interesting objects found in London. Dr. Stevens described a portion of the Roman road, the Portway, near Andover, now being removed. Mr. Loftus Brock exhibited some sixteenth century pottery from the Mercers' Hall, Cheapside, where the road is being widened, revealing a portion of the foundations of the chapel of St. Thomas à Becket. The Rev. S. M. Mayhew described some perfect articles of Roman date from Seething-lane, and a tile from York bearing the stamp of the ninth legion. The first paper was read by the Rev. S. M. Mayhew, who described at length the important Roman remains recently discovered at Lincoln. Mr. Loftus Brock pointed out that the columns must have been about 25 ft. high, but from their distance apart, above 13 ft., it was probable that the architecture above was of wood, a remark justified by recent discoveries elsewhere. The second paper was by the Rev. Dr. Hooppell, who took for his theme the Tenth Iter of Antoninus, and proposed a new reading of its course, and Tynemouth (Tunnocellum) as its starting point. The third paper was by Mr. R. Allen, who described the singular cut circles on the rocks at Ilkley, where they are found in considerable numbers.

JAN. 15TH.—T. Morgan, Esq., in the chair. The Rev. — Chandler reported the discovery of the altar-slab of Waterbeach Church. It is of gray marble, and has been supported by six pilasters, fragments of which were found. Dr. Woodhouse, as a warning to antiquaries, exhibited a large collection of forged articles. Mr. Loftus Brock described an African jug of modern date, but having the form an colouring of early times, being an example of the continuance of ancient types in the country. Mr. G. Hills reported that several fragments of Roman date had been found in Chichester Cathedral, indicating the prior existence of Roman buildings on the site. He exhibited red tesseræ and Samian ware, and spoke of flue tiles having been found. Mr. Hills then read the first paper, descriptive of the recent discovery of earthenware vessels at Leeds Church, Kent. They are built up over the arches of the nave, and were inserted probably in the belief that they would help the accoustic effect of the building. The arches are of fifteenth century date, but the jars appear to be older. The subject of acoustic pottery in churches was dwelt upon at length. Mr. R. Blair described a great number of small articles carved in jet found on the site of the Roman station, South Shields, which are very peculiar in form. Mr. De Gray Birch commented upon the peculiarities of the inscriptions. Mr. R. Smith reported the discovery on the Allier of the site of a roman manufactory of small statuettes of white clay, and exhibited a series of photographs of the most interesting. These articles are of rare occurrence in England. Mr. Morgan read the second paper, taking for his theme the positions of the Roman armies of North Britain in the second and third centuries, the positions being indicated by numerous evidences which were passed in review, while recent discoveries were mentioned which afford additional information. The third paper was by Mr. W. C. Little, who traced the course of a Roman road across the Cambridgeshire fens, and described its construction of gravel upon a layer of branches. It is generally twenty-five feet wide.

ARCHÆOLOGICAL INSTITUTE.

DEC. 5TH.—C. D. E Fortnum, Esq., V.P., in the chair.—The Chairman spoke of the loss that the Institute had suffered by the death of Mr. J. Henderson, for many years their honorary treasurer. He then read an account of a jet *signaculum* of St. James of Compostella, which he exhibited. Mr. J. T. Micklethwaite produced a fine fourteenth century English *horæ*, and described its peculiarities. Mr. W. Burges exhibited a tilting-helm of Thomas, Lord Delaware (1526), from Broadwater Church. The Rev. D. Evans sent a seal of "John Javziundus," found under the floor of Abergele Church, early fourteenth century. The Rev. R. S. Baker exhibited a diminutive figure, found in the *oppidum* at Irchester, which was doubtfully accepted as Roman. Mr. H. Middleton sent drawings of stocks, whip-post, and pillory at Coleshill. Mr. W. T. Watkin sent sketches and notes from Dr. Hübner and others concerning the tomb and inscription to Regina, lately found at Binchester, and notices of Roman discoveries at Winchester and Carlisle.

LINNEAN SOCIETY.

DEC. 5TH.—Prof. Allman, President, in the chair.—Messrs. G. F. Dowdeswell, A. Hammond, T. Hanbury, J. Sidebotham, W. Thomson, and C. A. Wright were elected Fellows. Dr. I. B. Balfour exhibited and made remarks on a rare Myxomycetes. Mr. G. Murray called attention to a peculiar geenish yellow fungus (*Hygrophorous Wynniæ*, Berk. ?) got at Bridlington, Yorkshire. Examples of a moss new to Britain, the *Aulacomnium turgidum*, were shown by Mr. E. M. Holmes, who stated that they were found in Yorkshire by Mr. West and Dr. F. A. Lees. Mr. F. H. Waterhouse read a paper "On some Coleoptera of Geographical Interest collected by C. Darwin." These had lain undetermined for a long series of years, and now prove new to science: *Phytosus Darwinii*," from the Falklands, has unusually long slender claws; *Choleva falklandica* is elliptical shaped and strongly punctuated; *Elmis brunnea* and *Anthicus Wollastoni*, from St. Helena, are note worthy, for even Mr. Wollaston does not record either genus as existent there; *Scaphisoma elongatum*, from Rio de Janeiro, is the first species of the genus known to inhabit South America; and Prosthetops (*P. Capenis*) is a novel genus with two ocelli, from South Africa. Mr. C. B. Clarke, in a "Note on *Gardenia turgida*," stated that in books the flower calyx of males was alone described, while all herbaria specimens are diœcious, and males and females have been referred to different genera. The precise characters of each were denoted—Dr. F. Day gave a summary of his (third) concluding paper "On the Geographical Distribution of Fresh-water Fishes of India," in this dealing with the Scombresocidæ, Cyprinodontidæ, Cyprinidæ, Notopteridæ, and Symbranchidæ. Among the 87 genera, 2 only are African, 32 extend to the Malay Archipelago, and 12 are common to Africa and Malaya; of 369 species, 2 are African, 27 Malayan, and 2 common to both regions. In short, the affinities preponderate to the Indo-Chinese and Malay sub regions, thus supporting Wallace's in contradistinction to the views of Mr. Blandford, who gives greater weight to African relationship so far as mammals are concerned. Dr. Day, moreover, believes the Indian fresh-water fishes point to three faunas: (1) the W. Ghauts, Ceylon, the Himalayas, and Malay Archipelago (with two fish races, Palæarctic and Malayan); (2) the plains west of Indus, with perhaps African attributes; (3) the east plains, with a Burmese, &c., connection. The abstract was read of a second contributions "On the Mollusca of the Challenger Expedition," by the Rev. R. B. Watson.

CHEMICAL SOCIETY.

DEC. 5TH.—Dr. Gladstone, President, in the chair. Prof. Tidy read a lengthy and important paper "On the Processes for Determining the Organic Purity of Potable Waters." The conclusions at which the author arrives, after many experiments and a careful examination of the comparative analyses of over 1600 waters may be briefly summed up as follows: *The ammonia process* furnishes results which are marked by singular inconstancy and are not delicate enough to allow the recognition and classification of the finer grades of purity or impurity. The errors incidental to the process form an array of difficulties which become infinitely serious, seeing that the range (as regards albumenoid ammonia) between pure and dirty waters is comparatively small. *The combustion process* has all the evils of evaporation to encounter, but the organic carbon estimation is trustworthy; the organic nitrogen determination, however, scarcely yields absolutely trustworthy evidence on which to found an opinion as the probable source of the organic matter. The process, nevertheless, is of great value. *The oxygen* (permanganate) *process* avoids the errors incidental to evaporation, its results (when properly used) are constant and extremely delicate, it draws a sharp line between the putrescent or probably pernicious and the non-putrescent or probably harmless organic matter; by it a bad water can never be passed as good. As far as the three processes are concerned, the oxygen and combustion processes give closely concordant results, whilst those yielded by the ammonia process are often at direct variance with both. The discussion on this paper was postponed until after it had been printed, when a special meeting will be called for the purpose.

JAN. 16TH.—Dr. Gladstone, President, in the chair.—The following papers were read: "On the Action of Isobutyric Anhydride on the Aromatic Aldehydes," by W. H. Perkin; "On Two Methods for the Estimation of Minute quantities of Carbon and their Application to Water Analysis," by Drs. Dupré and Hake. The first consists of burning the substance in a current of oxygen in a combustion tube with oxide of copper, absorbing the carbonic acid in a Pettenkofer tube with baryta water, filtering off the barium carbonate with great care, converting into chloride, then into sulphate, and weighing. In the second the carbonic acid passes into a two per cent solution of basic acetate of lead, and the turbidity compared with that produced by solutions of carbon of known strength in a Mills colorimeter; "On Stannic Ethide," by Dr. Frankland and Mr. A.

Lawrance; "On Aurin," by Messrs. R. S. Dale and C. Schorlemmer; "On the Derivatives of Diisobutyl," by Mr. W. C. Williams; "On the Action of Chlorine upon Iodine," by Mr. J. B. Hannay. The author confirms his previous conclusion, viz., that a body containing one atom of iodine and four atoms of chlorine does not exist.

INSTITUTION OF CIVIL ENGINEERS.

Dec. 10th.—Mr. Bateman, President, in the chrir.—A paper was read "On Railway Work in Japan," by Mr. W. F. Potter.

At the annual general meeting "to receive and deliberate upon the report of the Council on the state of the institution, with the annual statement of accounts, and to elect the Council and officers for the ensuing year," held in December, 1878, the President, Mr. J. F. Bateman, F.R.SS. L. and E., being in the chair. The report was read, which referred to the various proposals that had been made for changes in the bye-laws to distinguish between the professional and the non-professional associates, and to bring the bye-laws into harmony with the charter. A year ago the Council were instructed by the general meeting to prepare a scheme on the basis that the institution should hereafter consist of senior members or fellows, members, associates, and honorary members. This was done; but exception was taken to some of the bye-laws, and a resolution was passed to retain the title of member for the senior class. A modified set of bye-laws was thereupon framed by counsel, in which the titles heretofore existing were preserved; but it was provided that in future only those associates who were civil engineers by profession should be entitled to the privileges of corporate membership. These bye-laws were adopted, subject to an amendment that all present and future civil engineering associates, but no others, should be termed "associate members." The settlement thus arrived at would, it was hoped, allay any feelings of uneasiness that might have arisen from the long agitation of the subject. During the past session 95 associates had been transferred to the class of members, 56 members and 205 associates had been elected, and 15 members and 42 associates had been removed from the books by death or otherwise. There had thus been an increase of 136 members and 68 associates, together 204, or at the rate of upwards of 7 per cent. There were on the books on the 30th November last 16 honorary members, 1061 members, and 1738 associates, making a total of 2815, whereas ten years back these numbers were respectively 16, 637, and 896, or in the gross 1549. There were besides 500 students attached to the institution, out of the 965 that had been admitted since the class was established eleven years ago; of the balance, 254 had become associates, and 211 had ceased to remain on the lists. The income proper had amounted to £10,610 0s. 6d., of which more than one-tenth arose from dividends on investments belonging absolutely to the institution. The receipts also comprised a sum of £2984 19s. on account of capital—being in respect of life compositions and admission fees—and of £461 3s. 1d. from the Telford, Manby, Miller, and Howard trust funds. The nominal or par value of the funds belonging to the corporation (including cash at the bankers) was £27,932 2s. 6d., and the several trust funds £14,506 4s. 6d., together £42,429 7s., against £39,773 4s. 11d. last year. The investments had been increased by the purchase of £3000 Caledonian Railway 4 per cent debenture stock, and the cash balance was £606 2s. 1d. in excess of what it was on the 30th of November, 1877. The expenditure had been for house and establishment charges, £4985 10s. 3d., for "Minutes of Proceedings," £4954 8s. 4d., and for premiums and prizes under trust, £387 5s. 2d. In respect to the principal item, that for publications, it was explained that five quarterly volumes had been paid for within the year, and it was added that for the first time in the history of the Society there were no accounts owing either to the printers or lithographers, so that in future it might reasonably be expected that the income of each year would be applied in meeting the liabilities incurred within the same period. Of the quarterly volumes, an edition of 4000 copies had lately been printed, and, in round numbers, the cost of such an edition came to about £1000. At the twenty-four ordinary meetings, fifteen original communications had been read and discussed, and at one of these meetings the President had delivered an inaugural address. It was a matter for congratulation that the attendance at the meetings showed a steady and continual increase. The average last session was 274, the highest yet attained. In addition to the communication already referred to, twenty-five other papers had been selected for publication, and were included in the four volumes of Proceedings relating to the past session. These volumes contained 1609 pages of letterpress, illustrated by 39 plates and numerous woodcuts. The printed matter under Sect. I., "Minutes of Proceedings," extended to 114 pages; under Sect. II., "Other Selected Papers," to 328 pages; and under Sect. III., "Abstracts of Papers in Foreign Transactions and Periodicals," to 467 pages; the last section having been continued on the same scale as in the three preceding years. It was stated that a general index to the first fifty volumes of the "Minutes of Proceedings," including every paper published by the institution up to the end of the year 1877, was in the press, and would shortly be issued. This index would be limited to an alphabetical list of the subject of every paper and the names of the respective authors, with such cross references as had been deemed expedient, both to the special subjects of the different articles and to the subjects discussed, with, in the latter case, the names of the speakers. A "Name Register" would be given at the end of the volume. Supplemental meetings for students had been held on ten Friday evenings, at each of which a paper was read and discussed. The Council expressed gratification at having again felt justified in awarding a Miller scholarship—£40 per annum for three years. On this occasion it had been bestowed on Mr. William Bell Dawson, who had previously obtained at the McGill University at Montreal, and at the Ecole des Ponts et Chausée at Paris. The library contained a rare and unparalleled collection of engineering literature in all languages, and it was believed that no standard treatise of professional interest was long absent from the collection. It had been the constant care of successive councils to maintain its character and completeness; and as a means to this end, when any subject was brought before the institution, or an inquiry made, the officers invariably endeavoured to ascertain the titles of any treatises, reports, or pamphlets bearing on the question in which the library might be deficient, with a view to their being obtained. In conclusion, the Council stated that the progress of the institution during the past twelve months had been not less satisfactory than in former years. This was the more gratifying when it was considered that there had been a widespread and deep-rooted financial depression for so long a period, and that the well-being of the institution was largely dependent on the prosperity of the country. The anxiety of engineers to be enrolled on the register of the institution might be taken as evidence of the esteem in which it was held. Tho report having been adopted, the premium and prizes awarded at the close of last session were presented by the President, to whom the thanks of the meeting were unanimously voted, the services of the Vice-Presidents and Council, of the Auditors, and of the Secretaries being similarly acknowledged. The scrutineers (to whom a vote of thanks was passed by acclamation) reported that the following gentlemen had been duly elected to fill the several offices in the Council for the ensuing year:—Mr. John Frederic Bateman, F.R.S., President; Mr. J. Abernethy, Sir W. G. Armstrong, C.B., F.R.S., Mr. W. H. Barlow, F.R.S., and Mr. J. Brunlees, Vice-Presidents; Mr. W. Baker, Sir J. W. Bazalgette, C.B., Mr. G. Berkley, Mr. F. J. Bramwell, F.R.S, Mr. G. B. Bruce, Sir John Coode, Mr. W. Froude, M.A., F.R.S., Mr. A. Giles, M.P., Mr. H. Hayter, Dr. W. Pole, F.R.S., Mr. R. Rawlinson, C.B., Dr. C. W. Siemens, F.R.S., Mr. D. Stevenson, F.R.S., Sir Jos. Whitworth, Bart., F.R.S., and Mr. E. Woods, other members of Council.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

Jan. 7.—Anniversary Meeting.—Rev. Canon Beechy in the chair.—Twenty three candidates were elected members. The report of the Secretary for the ninth session, 1877-8, was read. The officers and Council for the current year were elected. The President is Dr. S. Birch. A communication "On Babylonian Tablets," from D. J. Oppert, was read.

ASTRONOMICAL SOCIETY.

Jan. 10.—Lord Lindsay, President, in the chair.—Prof. H. C. F. C. Schjellerup, Prof. A. Hall, Prof. A. Kreuger, and Prof. C. H. F. Peters were, at the recommendation of the Council, elected Associates. Lieut. C. W. Baillie, Messrs. F. W. Clerke, T. Cushing, R. T. A. Innes, C. Pendlebury, Rev. J. H. Morgan, Prof. C. W. Pritchett, Capt. J. Rankin, and Dr. A. Wright were elected Fellows. A paper on occultations of stars by the Moon and the phenomena of Jupiter's satellites observed at Greenwich during the past year was read. Mr. Christie had observed an occultation of the fourth satellite of Jupiter as much as 20″ before the time predicted in the *Nautical Almanac.* Mr. Dunkin read a note "On the Errors of Bouvart's Tables of the Planet Saturn." It appears that the errors of the tables are increasing rapidly, from some unexplained cause, and that during the last opposition, in 1878, the observed place of the planet differed more than 14″ of arc from the tabular place. Mr. Neison showed a map of the region about Hyginus, and discussed the observations of the alleged new crater discovered by Klein. Mr. Neison had himself, owing to cloudy weather, not been able to observe the moon at the time when the new crater would be visible: but the observations of Klein appear to have been confirmed by Schmidt, of Athens, and other Continental observers. On the other hand, it was stated that a spot was visible in the place of the new photograph taken some ten years ago; but the prevailing opinion appeared to be that the spot did not correspond to the descriptions of recent observers. Dr. W. Erck exhibited a new form of bichromate battery, which gives a current as strong as a Grove cell, and which is very constant in its action. Dilute bichromate solution is kept constantly flowing from a higher level through the battery, and the intensity of the current was stated to be only very slightly affected by alterations of the rate of flow of the liquid. Mr. Plummer described an observation of the projection of a star on the dark limb of the moon; and Mr. Downing read a paper "On the Relations of the North Polar Distances of the Melbourne Catalogue," which involves an important discussion of the tables of refraction at present in use.

SOCIETY OF ANTIQUARIES.

Jan. 9.—Dr. W. Smith, V.P., in the chair.—The Secretary read an extract from the minutes of Council of December 17th, from which it appeared that the Council, adopting the precedent which that day seventeen years they had followed on the occasion of the death of H.R.H. the Prince Consort, had drawn up and forwarded to her Majesty, the most gracious patron of the Society, an address on the lamented decease of her Royal Highness the Princess Alice. This being an evening appointed for the ballot, no papers were read. The following gentlemen were elected:—Messrs. F. A. H. Fitzgerald, H. C. M. Lyte, W. Kelly, J. Baron, A. J. Munby, R. W. Twigge, B. Nicholson, R. H. Fisher, G. A. Raikes, C. H. Cooke, and C. T. Newton (proposed by the Council).

ROYAL SOCIETY OF LITERATURE.

JAN. 8TH.—C. Clark, Esq., V.P., in the chair.—Mr. C. H. E. Carmichael read a paper "On Rubens and the Antwerp Art Congress," in which. after describing the general characteristics of the Rubens festival, and of the congress held in connection with it, the writer proceeded to analyse some of the principal discussions which took place on questions relating to Rubens and the art of his day, and expressed the hope that one of the principal resolutions of the Art Congress, the publication of a complete "Codex Diplomaticus Rubenianus," would receive material assistance both from public and private collections in the United Kingdom. On the conclusion of the paper a discussion took place, chiefly as to the position of Rubens in relation to art, in which the Chairman, Mr. Highton, Mr. Newton, and other gentlemen took part.

HISTORICAL SOCIETY.

JAN. 9TH,—Dr. Zerffi in the chair.—Six ordinary members were admitted. Dr. R. G. Latham read a paper "On the Early History of Hungary," which led to an animated discussion. Miss H. Taylor being absent, her paper was postponed to next meeting.

MATHEMATICAL SOCIETY.

JAN. 9TH.—C. W. Merrifield, Esq., President, in the chair.—Dr. J. Hopkinson was admitted into the Society. The following communications were made: "On a Theorem in Elliptic Functions," by Prof. Cayley; "On a New Modular Equation," by Prof. H. J. S. Smith; "On Co-efficients of Induction and Capacity of Two Electrified Spheres," by Prof. Greenhill; and "On Certain Systems of Partial Differential Equations of the First Order with several Dependent Variables," by Prof. Lloyd-Tanner.

ANTHROPOLOGICAL INSTITUTE.

JAN. 7TH.—J. Evans, Esq., D.C.L., President, in the chair.—Messrs O. C. V. Aldis and E. Farnfield were announced as members. The Rev. J. S. Whitmee read a paper entitled "Revised Nomenclature of the Inter-Oceanic Races of Men." A paper was read by the Rev. W. G. Lawes "On Ethnological Notes on Koitapu, Motu, and Neighbouring Tribes of New Guinea." This paper was based on information derived from a three years' résidence at Port Moresby. It is extremely important that all statements about New Guinea should be specific as to locality. It is even more important with reference to the people than to the country, in consequence of the diversities of race and tribe being so numerous. Twenty-five different dialects and languages are spoken, to Mr. Lawes's knowledge, in the 300 miles of coast extending from Yule Island to China Straits. Great importance is attached among the Motu to the tattooing of the women as a means of enhancing beauty. No importance seems to be attached by them to the pattern. The Koitapu are now for the most part to be found living at one end of the Motu villages, although preserving their distinctness and separateness. They are also to be found in little groups of a few houses a little way inland, on a hill overlooking the sea, all through the Motu district. The typical Koitapu man is slightly darker in colour than the Motu, and the hair is frizzy, not woolly. The Koiari are closely allied to the Koitapu, and inhabit the mountains at the back of the Motu and Koitapu district. They are physically inferior to the Motu and Koitapu, but more numerous. They are smaller in stature, darker in colour, and dirty in person. Their hands and feet are remarkably small. Tree houses are common, almost every village having one at a considerable height. Their language is similar to Koitapu. They cultivate the soil carefully, and are great hunters.

ASIATIC SOCIETY.

JAN. 20TH.—Sir H. C. Rawlinson, President, in the chair.—The Rev. Prof. Legge read the first part of a paper "On the Principles of Composition in Chinese deducted from the Nature of the Written Characters," in which he showed the truth of what has been repeatedly stated, viz., that there is no grammar in Chinese, and further that the student who wishes either to write or speak this language must dismiss from his mind all ideas of composition founded on the principles of grammar which govern alphabetic languages. Having exhibited the six principles of formation on which the Chinese characters are made, Dr. Legge discussed the navive division of the characters into *Shih* and *Hsü*, or *full, substantial*, and *empty*, showing that the division had been misunderstood by all who have written on the Chinese language from Prémare downwards, in that it has regard to the *structural* significance of the characters, and cannot, therefore, be legitimately used as if it was a grammatical distinction of them. Prof. Legge then treated the Chinese literature as written in the ancient, the literary, and the colloquial styles respectively, confining in his present paper his illustration of the principles of composition to the first of the three, and adding that Chinese composition was originally a system of signal telegraphy. In the most ancient style he stated that we find the primitive telegraphy by written characters struggling into the definiteness of grammatical writing, yet without grammar. The conclusion of his paper will be given on February 17th.

NUMISMATIC SOCIETY.

JAN. 16TH.—J. Evans, Esq., D.C.L,, President, in the chair. The Hon. C. W. Fremantle and the Hon. Milo George Talbot were elected Members. Mr. Evans exhibited a decadrachm of Syracuse in a very fine state of preservation, and signed by the artist Evænetus. Mr. Cochran-Patrick communicated a paper on some Mint Accounts of the Kingdom of Scotland, after the accession of James VI., containing particulars of the amount of standard silver minted between A.D. 1605 and 1695, and of the number of the various silver coins struck from it. Major A. B. Creeke communicated a paper on an unpublished and unique Anglo-Saxon silver farthing, having on the obverse the (so-called) iron glove of Thor, and on the reverse the monogram of Carolus. This coin is attributed to Regnald I., King of Northumbria *circ.* A.D. 919.

ZOOLOGICAL SOCIETY.

JAN. 14TH.—Prof. Newton, V.P., in the chair.—The Chairman called attention to the great loss which the Society and zoological science had sustained by the recent death of their President, the Marquis of Tweeddale. The secretary read a report on the additions that had been made to the society's menagerie during December. Dr. Traquair exhibited a specimen of the Hackled Pigeon (*Alectorœnas nitidissima*) recognised last September in the Museum of Science and Art in Edinburgh by Prof. Newton, who made some remarks on the species. Letters and papers were read from Commander Hoskins, on the subject of the range of the Mooruk; from the Rev. G. Brown, giving additional particulars on the same subject; from R. Trimen, of Cape Town, on the subject of the true locality of the Black Spurwinged Goose (*Plecíropterus niger*); from Dr. M. Watson and Dr. A. H. Young, on the anatomy of the Spotted Hyena (*Hyæna crocuta*); from Mr. A. D. Bartlett, giving an account of the habits and changes of plumage of Humboldt's Penguin; from Dr. O. Finsch, on a collection of birds made by Mr. Huebner on Duke of York Island and New Britain; from Mr. E. J. Miers, on Crustacea collected by Capt. H. C. St. John in the Corean and Japanese Seas; from Count T. Salvadori, on Mr. Elliott's paper on the fruit pigeons of the genus Ptilopus, lately published in the Society's *Proceedings;* from the late Marquis of Tweeddale, ths twelfth of a series of contributions to the ornithology of the Philippines; the present paper gave an account of the collection made by Mr. A. H. Everett in the Island of Basilan; and by Dr. A. Günther, on the Mammals, Reptiles, and Batrachians recently collected by Mr. Everett in the Philippine Islands, and calling special attention to a new form of snakes of the family Calamariidæ, of which one example had been obtained.

MICROSCOPICAL SOCIETY.

JAN. 8TH.—J. W. Stephenson, Esq., Treasurer, in the chair.—The following papers were read: "Observations on *Dactylocalyx pumiceus* (Stuchbury), with Description of a new Variety, *D. Stuchburyi*," by Mr. W. J. Sollas; "Note on a Revolver Immersion Prism." by Dr. J. Edmunds; "Immersion Illuminators," by Mr. J. Myall, jun.; "Is Not the Genus Pedalion of Hudson Synonymous with Hexarthra of Schmarda?" by Mr. J. Deby; and "The Thallus of Diatoms," by Mr. J. Kitton. Mr. F. Crisp (Secretary) described the two new sense organs in insects discovered by Prof. Graber, of Czernowitz.

METEOROLOGICAL SOCIETY.

JAN. 15TH.—Annual Meeting.—Mr. C. Greaves, President, in the chair.—The report of the Council showed that the chief features of the proceedings during the year 1878 had been the final completion, on a comprehensive and well-organised basis, of the arrangements for systematic inspection of the society's stations, and the delivery of a series of lectures on meteorology. Forty-one Fellows have been elected during the year. The President having delivered his address on Dryness *versus* Humidity, the following gentlemen were elected officers and Council for the ensuing year:—President, C. Greaves; Vice-Presidents, C. Brooke, H. S. Eaton, Rev. C. W. Ley, and Capt. H. Toynbee; Treasurer, H. Perigal; Trustees, Sir A. Brady and S. W. Silver; Secretaries, J. G. Symonds and Dr. J. W. Tripe; Foreign Secretary, R. H. Scott; Council, A. Brewin, E. E. Dymond, W. Ellis, R, Field, Rev. H. Griffith, W. J. Harris, J. P. Harrison, J. K. Laughton, R. J. Lecky, Hon. F. A. R. Russell, R. Strachan, and H. S. Tabor.

QUEKETT MICROSCOPICAL SOCIETY.

NOV. 22ND.—Prof. T. H. Huxley, President, in the chair.—Three new members were elected. The President brought under the notice of the society a new form of dissecting microscope. Mr. C. Stewart exhibited some specimens of black ozokerit, and described its application to the lining of troughs, &c., for the purposes of microscopical dissections.

SOCIETY OF ARTS.

Dec. 11th.—Capt. Sir H. Tyler in the chair. —The paper read was "On Railways in India and Turkey," by Dr. Hyde Clarke.

SOCIETY OF ENGINEERS.

Dec. 9th.—Mr. R. P. Spice, President, in the chair.—The following gentlemen were elected as the council and officers of society for the year 1879: President, Mr. R. P. Spice; Vice-Presidents, Messrs. J. Bernays, C. Horsley, and T. Porter; other Members of the Council, Messrs. C. Barnard, J. Church, S. Cutler, F. E. Duckham, F. W. Hartley, A. Rigg, J. Walker, and W. Schönheyder; Hon. Secretary and Treasurer, Mr. A. Williams; Auditor, Mr. W. H. Bennett.

MINERALOGICAL SOCIETY.

Jan. 7.—Mr. H. C. Sorby, President, in the chair.—The following papers were read or taken as read:—"On Pilolite, an Unrecognised Species," by Prof. M. F. Heddle; "On so-called Green Garnets from the Urals," by Prof. A. H. Church; "On the Magnetism of Rocks and Minerals," by Mr. J. B. Hannay; "On the Celestine and Baryto-celestine of Clifton," by Mr. J. N. Collis; "On some Silicates of Copper," by Mr. W. Semmons: "Contributions towards a History of British Meteorites," by Mr. T. M. Hall; "Notes on some Crystals of Iron," by Mr. A. Beardsley; and "Notes on Massive and Crystallised Cronstedtites from Wheel Sand," by Mr. A. K. Barnett.

SOCIETY OF ANTIQUARIES.

Jan. 16.—A. W. Franks, Esq., Director, in the chair.—The Rev. J. Beck exhibited a bronze palstave, ploughed up on a farm near Perth, and ornamented on each face with punched or engraved triangles in three rows. Mr. Beck also exhibited, by permission of Sir W. H. Peck, a monumental effigy in silver *repoussé*, seven and a quarter inches by six and a quarter, in memory of Lydia, daughter of Henry Wharton, of London, and wife of John Collier, son of Mr. R. Collier, of Oxon. She was born November 20, 1648, and died May 13, 1673. Their two infant daughters, Lydia (*ob.* 1671) and Hester (*ob.* 1673) are also figured, the one in swaddling clothes, the other as a girl habited as Time, with a scythe and hour-glass. Can this be a copy of a larger monument in some churchyard in Oxfordshire? Mr. J. C. Robinson exhibited a professional cross in brass, English work of the fifteenth century. The circular medallions at the ends of the arms, enclosing emblems of the evangelists, instead of being in bas-relief, as usual (and as seen in a drawing of a precisely similar cross at Turnham Church, Lancashire, exhibited by Mr. Micklethwaite), are of engraved copper, the lines filled in with black enamel. Mr. Robinson also exhibited two silver-gilt figures, in *repoussé* work, which were stated to have formed part of a famous shrine or "custodia" in the Cathedral of Cuenca, in Spain, the work of one of the Becerril family. Mr. A. Heales communicated an account of some sepulchral remains at Tipasa, on the coast of Algeria. Mr. E. W. Brabrook read a paper "On the Origin of the Office of King's Advocate-General."

Mr. Edward Huber, of Marion, Ohio, has patented an improved feed water heater, which consists in the peculiar construction and arrangement of a circular jacket, arranged about the smoke chamber of the boiler, having a supply pipe and a discharge pipe leading to the boiler, so that the water, in passing through said jacket to the boiler, is not only heated before being delivered into the boiler, but also serves to prevent the smoke chamber from being burned out.

ORNITHOLOGY OF THE UNITED STATES OF AMERICA.

Ermine Case, jun., in an article which appears in the Kansas City *Review of Science and Industry*, thus deals with the above-mentioned subject:—

Science is but observation tabulated. The observer need not necessarily be a scientist. If he be a faithful reporter his contributions may be as valuable to science as the technical collator's tables. The lovers of nature and the sportsmen have been in all times invaluable assistants to the specialists. As the literature of science becomes less technical and more popular in its character, thousands of observers are added to the army which is marching upon the rocks, charging upon the herbage, and flanking the animal kingdom — compelling their secrets for the use of the laboratory and the museum. The alchemist has disappeared. the crucible he used to turn dross into gold is now presided over by the quiet, earnest man, looking only for truth. The unscientific observer should not preface his report with an essay, so we proceed.

The district included within a radius of one hundred miles of Kansas City is similar, in the respects we shall mention, to the remainder of the central Missouri valley. There exist in this region peculiarities in habits of birds well worthy of record. There also exist here many species of birds whose habitat has been placed in distant latitudes containing conditions of climate, atmosphere, &c., very different from ours, and it is very strange that so little has been said of the many marked peculiarities in this field. But it is not the object of this paper to note all the differences which have been observed, but only to suggest the subject by some well-defined instances.

The common quail or Virginia partridge exists in large numbers in all quarters of the United States east of the 100th meridian, possibly west of it, it matters not in the premises. Taking the State of Ohio as a representative region for the eastern and middle States, it will be acknowledged that quail on that parallel do not immigrate to the southward in the autumn and return north again in the spring. There a covey of these birds can be found every day for an entire season within one hundred rods of the same spot, and even pursuit with dog and gun will not drive them away. But it is quite different in the region we have named. Here the quail do pass to the southward every fall, beginning usually about October first and continuing until mid-November unless the season is severe. The movement is general and is continued persistently. Each covey maintains its organisation and its direct, independent march towards the south, not diverging from a right line even to avoid towns or considerable cities. Wide rivers do not deter them—they often fall into the Missouri, not being able to sustain their flight across. When frightened they scatter, but still fly on to the south, quickly calling together again to pursue their certain road. How far they travel cannot be definitely known, as they cannot, of course, be followed or identified, but that they become poor and lean by their long travels is well known. We can feel certain that they do not generally pass below the northern line of the Indian Territory, as they are found gathered in the southern counties of Kansas in unusual numbers during mid-winter. They pass north with the same fearless directness in March and April, but not always in flocks, having then, in the great part, paired.

The pinnated grouse or prairie chicken migrates to the south in the early autumn, and returns northward in the spring. This is not strictly peculiar to this region, but it is more general and the flight is to a lower latitude than in the region east of the Mississippi River.

Piercing cold, driven by furious winds over an unsheltered country, is suggested as the chief cause of these migrations. The same causes affect the smaller birds of all kinds. More of them go south for the winter, and they go farther than is the habit of the same species in the Ohio region.

We pass to a peculiarity of another character. Along the Atlantic coast of the United States are many birds of a semi-aquatic character. They frequent the salt marshes, bars, inlets, creeks, and tidal margins. They pass backward and forward every season. They are known among sportsmen and writers as "Bay Birds," and this term includes a half-dozen varieties of plover, turn-stones, sand-pipers, godwits, curlew, &c. Very few of these birds are ever seen between the head of tide-waters of the Atlantic and the western part of the State of Missouri; but as the timber country thins out into broad prairies, and the prairies in turn rise into the higher plains, we begin to find in the high, dry altitudes these same birds which we had left in the moist region of the sea levels. What should take this host of waders to the sand-hills and alkali plains of western Kansas and Nebraska? Here are the great sickle-billed curlew, the golden plover, the smaller and greater willow legs, the common gray plover, and the large brown godwit, with almost every species of the other bay birds with which one could become familiar at Montauk Point or Barnegat Bay. The conditions of climate vary widely, as must also be the case with their food, opportunities for resting, and the practice of their peculiar habits of wading and mud-dabbling. We can only query whether they will be waiting for the return of that ocean which in early geological times we are told covered the great plains.

We pass to another branch of our topic. Mr. Stanley in coming down the Congo met with flocks of pelicans, cormorants, gray-plumed herons, and white cranes. These strange birds, of uncouth form and weird plumage, seem well fitted to the equatorial wilderness in the valley of that great river. Those birds are indigenous to the retired swamps of Florida and the gulf coast, but they are unknown to the middle region of the United States. On the wildest parts of the Ohio, Tennessee, and Cumberland rivers they are so rare, if ever seen, that mention is never made of them. But here on the Missouri, on the Platte, and the Kansas rivers, and on all the small lakes of the valleys, all of these species are regularly seen. If one will float quietly down the Missouri in a small boat from St. Joseph to Kansas City in the month of November, he will find on the bars not only the great white crane, colossal in height and in the extreme speed of its wings, but the cormorant with its red face, dark plumage, and dull, heavy motion; the pelicans in groups fishing in the shoal waters and also in the bayous, the plumed heron with long crest and beautiful grey-blue plumage, erect, still, and vigilant. He will meet at the same time a half-dozen varieties of gulls, ranging from the light grey ocean swallow, smaller than a pigeon, to the enormous white gull of mid-ocean. It is a rare and interesting sight for the keen, business-loving people of our latitude, upon this stretch of our great, unpicturesque river, to find these denizens of foreign lands sporting and feeding among the wild fowl, of which the usual varieties are so plentiful upon our waters.

Mr. Asa E. Stratton, jun., of Brazoria, Texas, has patented an improved car axle bearing, which consists in a box having a chambered back for containing oil, and having grooves along the straight edges of its bearing surface for receiving a wick, the ends of which extend through holes in the box into the oil reservoir.

THE INVENTORS' INSTITUTE

ESTABLISHED 1st MAY, 1862.

FORTNIGHTLY MEETINGS, DURING SESSION,

HELD (NOVEMBER TO MAY INCLUSIVE) AT

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, W.C.

PAST PRESIDENT—SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the Establishment of the INVENTORS' INSTITUTE till his decease, February, 1868.

PAST PRESIDENT—LORD RICHARD GROSVENOR, M.P., &c., from February, 1868, till May, 1871.

Council:

PRESIDENT OF THE INSTITUTE,

SIR ANTONIO BRADY.

The Right Hon. The Earl of Caithness, Vice-Pres.
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